Unasylva

Volume IV, Number 2 • April-June 1950

The forest crop of the future

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

NORRIS E. DODD, *Director-General*
SIR HERBERT BROADLEY, K.B.E., *Deputy Director-General*

DIVISION OF FORESTRY AND FOREST PRODUCTS

MARCEL LELOUP, *Director*
EGON GLESINGER, *Deputy Director*
R. C. FORTUNESCU, *Executive Officer*

HEADQUARTERS (Washington)

B. CLARKE
N. DE FELSÖVANYI
T. FRANÇOIS
J. D. B. HARRISON
J. KAGAN
E. MÖRATH
H. RECART
T. V. TARKIAINEN
L. J. VERNELL
J. VINZANT

EUROPEAN WORKING GROUP (Geneva)

D. R. CAMERON, *Chief*
F. CZERNIN
R. G. FONTAINE
E. KALKKINEN
P. SARTORIUS

LATIN-AMERICAN WORKING GROUP (Rio de Janeiro)

P. TERVER, *Chief*
H. SCAVENIUS

FAR EASTERN WORKING GROUP (Bangkok)

M. A. HUBERMAN, *Chief*
C. PURKAYASTHA

STANDING ADVISORY COMMITTEE ON FORESTRY AND FOREST PRODUCTS

Chairman: L. F. WATTS
Chief of U. S. Forest Service, Washington, D. C., U. S. A.

Vice-Chairman: B. DUFAY
Hon. Director-General of Waters and Forests, Paris, France

R. R. CASTAÑEDA, *Ministry of Forestry and Agriculture, Bogotá, Colombia*

G. CERF, *Adviser to the Belgian Government on International Timber Affairs, Brussels, Belgium*

A. CESCHI, *Counsellor, Ministry of Commerce, Vienna, Austria*

H. G. CHAMPION, *Professor of Forestry, Imperial Forestry Institute, Oxford, England*

M. D. CHATURVEDI, *Inspector-General of Forests, Ministry of Agriculture, New Delhi, India*

A. R. ENTRICAN, *Director of Forestry, State Forest Service, Wellington, New Zealand*

A. FJELSTAD, *Delegate of the Royal Norwegian Government for Agricultural Affairs, Washington, D. C., U. S. A.*

S. C. LEE, *Director, Forestry Administration, Formosa*

D. A. MACDONALD, *Director, Forestry Branch, Department of Resources and Development, Ottawa, Canada*

H. MARK, *Director of the Institute of Polymer Research and of the Chemical Department, Brooklyn Polytechnic Institute, New York, U.S.A.*

A. PAVARI, *Director, Forestry Experiment Station, Florence, Italy*

G. J. RODGER, *Director-General, Commonwealth Forestry and Timber Bureau, Melbourne, Australia*

S. A. ROMERO, *Director of Forestry, Ministry of Agriculture, Caracas, Venezuela*

E. SAARI, *Professor, Forestry Department, University of Helsinki, Finland*

P. DE SOUZA, *Chief, Division of Forests and Parks, Ministry of Agriculture and Forestry, Rio de Janeiro, Brazil*

F. TAMESIS, *Director, Bureau of Forestry, Department of Agriculture and Natural Resources, Manila, Philippine Republic*

H. G. WINKELMANN, *Director of the Swiss Forest Economy Association, Solothurn, Switzerland*

TECHNICAL COMMITTEES

Forestry Education: *Chairman*, H. G. CHAMPION, *Professor of Forestry, Oxford University, England*

Wood Chemistry: *Chairman*, H. MARK, *Director of the Institute of Polymer Research and of the Chemical Department, Brooklyn Polytechnic Institute, New York, U.S.A.*

Mechanical Wood Technology: *Chairman*, J. CAMPREDON, *Chief of the National Timber Institute, Paris, France*

Unexploited Forests: *Chairman*, T. GILL, *Secretary of the Charles Lathrop Pack Forestry Foundation, Washington, D. C., U. S. A.*

Forest Research: *Chairman*, E. I. KOTOK, *Assistant Chief in Charge of Research, U. S. Forest Service, Washington, D. C., U. S. A.*

Unasylva

An International Review of Forestry and Forest Products

April-June 1950 **Vol. IV, No. 2**

CONTENTS

Cover photograph by courtesy of U. S. Forest Service: Old growth Douglas fir with hemlock understory, Willamette National Forest, Oregon.

THE FOREST CROP OF THE FUTURE — QUALITY OR QUANTITY? 51
By the Staff of FAO's Division of Forestry and Forest Products

FOREST RESOURCES OF THE WORLD — Supplementary Data to the Original FAO Study 57

ORGANIZATION OF RESEARCH IN FRANCE

I. Forest Research 60
By R. C. ROL, Professor, National School of Waters and Forests, Nancy

II. Forest Products Research 63
By M. VILLIÈRE, Inspector of Waters and Forests at the Central Timber Testing Laboratory, Paris

COMMODITY REPORTS

Wood Pulp 69

Pitprops 78

THE WORK OF FAO

FAO's Program for Forestry and Forest Products (As reviewed by the Fifth Session of the FAO Conference) 81

Latin-American Forestry and Forest Products Commission 85

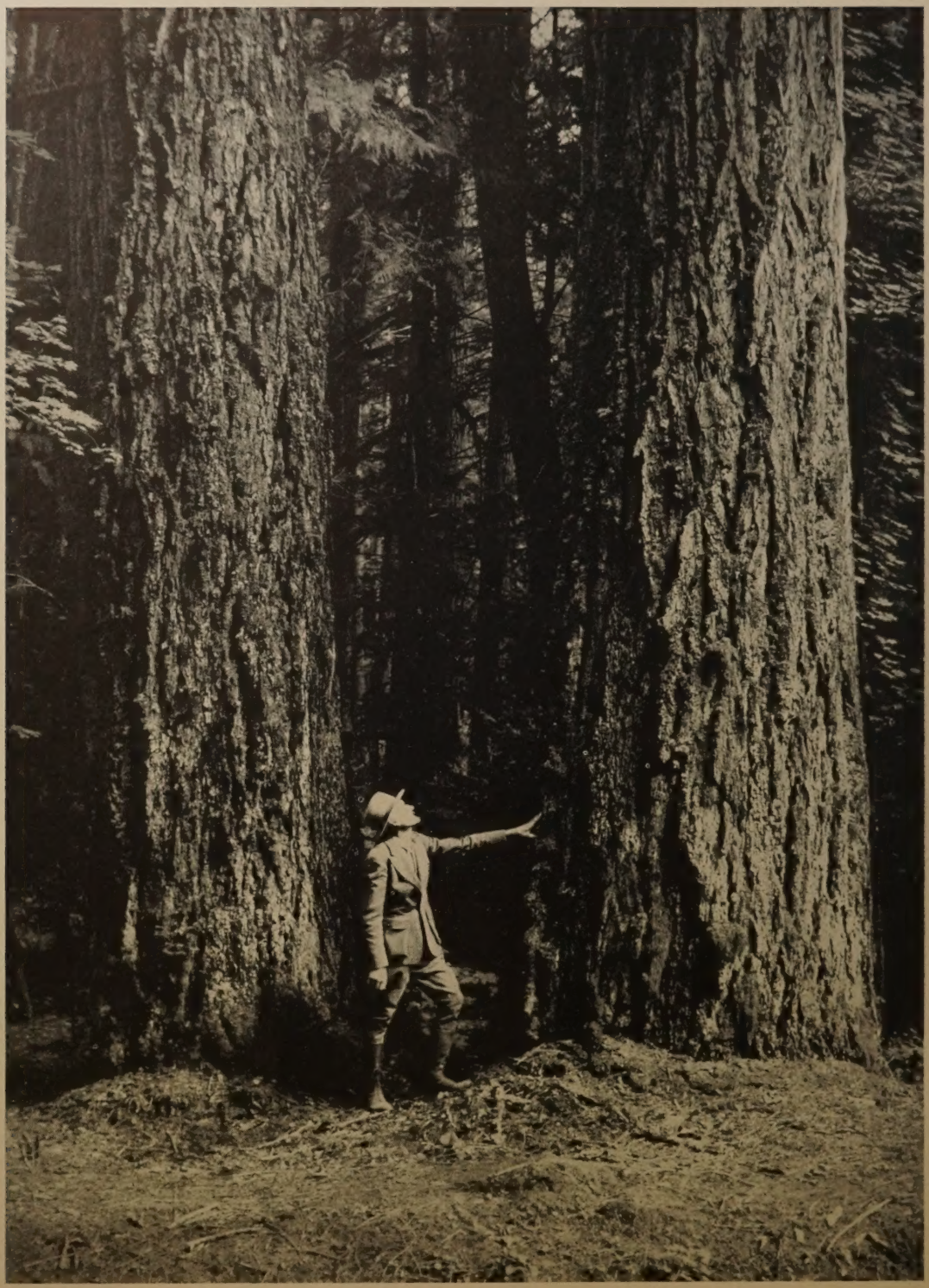
FAO Mission to Nicaragua 85

NEWS OF THE WORLD 86

Reviews 94

Editor's Note: *It has been found necessary to rearrange the contents of the next two issues of* UNASYLVA— *Numbers 3 and 4. Because the United Nations Conference on Technical Assistance, originally scheduled for the beginning of 1950, has been postponed until 16 May,* UNASYLVA *will publish the symposium on forestry aspects of the technical assistance program in issue Number 4, instead of in Number 3 as previously announced. Readers will understand that it is obviously desirable to know the outcome of this meeting before discussing the program of FAO and of the member countries with regard to Point 4. The postponement will necessitate other minor changes in the contents of issues Numbers 3 and 4.*

UNASYLVA is prepared by the Division of Forestry and Forest Products and published by the Information Division of FAO at the Organization's temporary headquarters in Washington, D. C. It is printed in Baltimore, Maryland, U.S.A. UNASYLVA is published in English, French, and Spanish. In conformity with the established custom of FAO, all units of measurement used in UNASYLVA are given in the author's figures. The metric equivalents are added, where necessary, in parentheses. UNASYLVA may be obtained from the sales agents listed on the inside back cover. Annual subscription US$2.50, single copy 65 cents; rates are payable *in local currencies* when orders are placed through local sales agents.



Douglas firs (Pseudotsuga taxifolia) *of this quality are unlikely to be grown again, outside National Parks.*

The Forest Crop of the Future — Quality or Quantity?

By the STAFF OF FAO'S DIVISION OF FORESTRY AND FOREST PRODUCTS

WILL quality or quantity be required in the forest crop of the future?

This question is particularly important since a forest responds slowly to silvicultural treatment; a change in wood utilization trends in nature or degree therefore necessitates early action by the forester if advantage is to be taken of that change with the least delay.

In presenting one of the papers prepared by FAO for the Third World Forestry Congress at Helsinki, an FAO representative suggested at a plenary session that in the future forests may be required to produce quantity rather than quality. Several speakers supported that suggestion; the majority, however, deplored the idea, maintaining that the forester's aim will continue to be the production of crops of the highest quality. Since the matter was not pursued further at the Congress and was therefore left rather in the air, it may now be appropriate to elaborate the attitude of FAO's Division of Forestry and Forest Products in regard to this question.

The Helsinki Congress expressed the view that the primary task of the forester is to grow and produce both the amounts and kinds of forest products needed by industry and other consumers. It thereby implied that the requirements of the trade must be given first consideration in any attempt to lay down the general lines of a forest production policy.

Such a policy must be based on an appraisal of the long-term evolution of world needs. An appraisal of this nature can obviously only be made in very general terms. It can only consider industrial requirements on the world scale, whilst acknowledging that the development of these requirements will acquire varying emphasis in different parts of the world. Non-industrial requirements, such as firewood, must be largely ignored. No special weight can be given to the relative accessibility of various forests to factories manufacturing secondary products or to the extraction problems of different forest areas. Nor can consideration be given to any functions of the forest other than its production function.

The forester will be concerned with any trends revealed by the appraisal which will affect the object of management and therefore the treatment of forests. The extent to which forest management will be affected can similarly only be expressed in general terms, and this limitation may open certain loopholes for objections owing to the fact that there will almost certainly be instances or circumstances which will not conform to the over-all general conclusions.

However, the major objection is likely to stem from alarm lest, in the fervor for chemical conversion and new methods of reconstituting wood, the old art of producing timber of high quality should lose its importance, and that henceforward it will be a question of crude mass production to feed these methods of utilization. We do not hold the view that for the future the forester's concept of "quality" is in danger. On the contrary, we are of the opinion that the need for "quality" as the forester sees it will remain secure, and in fact we think that the discernible trends will enhance the prospects for more intensive silviculture.

Apprehension seems to us to arise through a misconception of what is meant by "quality," and if that is so, it is desirable at once to attempt to clarify the meaning.

What is quality?

To answer this question, some definition of the term must first be attempted. Now the meaning of "quantity" is more or less self-evident, but unfortunately "quality" can mean one thing to the forester and something quite different to the trade.

When contemplating "quality" the forester thinks in terms of the forest stand, the tree, and the wood, and it is easy to imagine "quality" as embodying all three. The forester and the trade do not, however, always have the same outlook, and this is understandable. The forester naturally has what almost amounts to affection for a crop of trees he has nursed towards maturity, an affection that cannot be expected from the trade which views the forest mainly as a source of raw material, obtainable when its components—the trees—are felled at their due time. The forester cannot have quite the same regard for the wood as the trader does; the latter's main concern is with the wood

and its conversion into manufactured or semimanufactured commodities, a phase with which foresters, at least those who are essentially field officers, are not often intimately conversant.

Now quality may be judged by different criteria. First, "quality" may have reference to the wood itself—the intrinsic properties or characters relative to the purpose for which it is required, such as density, hardness, strength, length of fibers, and figure.

Secondly, "quality" may refer not so much to the wood itself as to the tree which provides the wood. In such a case, diameter, length of bole, absence of knots, and grain will be the main features assessed. The forester may be able to influence the properties and characters in the group first mentioned, although the extent to which this is possible is not well understood and certainly not predictable. But in the case of this second group he can exert appreciable influence, subject naturally to local conditions of soil and climate. In particular, he can control diameter, but more of that later.

Thirdly, "quality" may also imply the general aesthetic appeal of a forest stand. To the forester a stand of high quality is one where the canopy is sufficiently dense, the soil good, and the trees tall and straight with well-balanced crowns. Certain of the properties and characters mentioned in the paragraphs above are of course inherent in these characteristics.

Fourthly, and finally, "quality" may be a general measure of the actual trade value of the wood or of the growing stock which produces it. A wood, tree, or stand is commonly assessed as of high quality because it is of high commercial value. But here one must be careful to distinguish between value relating to wood as raw material and the value *in situ* of a standing tree or a whole stand.

The value of wood is directly related to its usefulness for specific purposes, to the range of such purposes, and to quantities available. Its usefulness depends on its intrinsic properties, particularly the mechanical properties and sometimes the physical characters referred to earlier. A wood whose utility will serve a large number of different purposes is obviously of greater value than one whose utility is more limited. Relative abundance also affects the value: inadequate supplies may make for lower value but in certain cases and especially with ornamental timbers, the absence of a plentiful supply usually helps to keep up the value—a luxury value. A case in point is the timber from certain oak forests of Central and Western Europe. This timber is scarce but is naturally suited for high-class veneer, cabinet work, and so on, and on that account demands a high price. If, however, the special luxury markets should disappear, or if plentiful new sources of the same quality wood should be developed, the price of the wood would obviously drop, for in both cases the luxury value would be gone.

Value owed to a special supply and demand situation may fluctuate considerably, and often with suddenness. During the war, timber suitable for use only as fuelwood became very valuable because other sources of fuel were shut off. A more striking example is that of the "true firs" and hemlocks of the forests of the west coast of North America. The wood of these trees, which occur in mixed forests with Douglas fir, was formerly regarded as useless, and there was no demand for it. However, the general shortage of timber during the war led to a search for new supplies, and it was found that with suitable treatment the wood of these species could be adapted to a great variety of uses. As a result, they acquired a value in their own right on the timber markets of this region.

The value of a tree or stand will vary with the market value of the timber, but the relationship between these two values will differ according to accessibility and relative difficulties of extraction. For instance, a forest which provides only a harvest of pitprops has naturally a higher value the nearer it is located to the minehead.

Trade "quality" and the forester's "quality"

In view of the varied interpretations which can be attached to the word "quality," it is not surprising that the trade and the forester often tend to think in different terms.

For the trade the prime factor is the value of the timber, based on suitability for the purpose for which it is required. The user is not interested in the vigor, health, or appearance of the stand from which the timber has come. He assesses value according to utility and the extent to which the raw material measures up to the particular requirements of an industry.

But different industries demand different qualities in timber. There are two main categories of industrial users: one breaks down wood in its solid form, and sawmill operators are most numerous in this group; the other processes wood by mechanical or chemical means into a so-called "disintegrated" form, and here pulp manufacturers are clearly the most important class. (This classification excludes those who only deal in wood as potential fuel.)

For the first category of users, the quality of the timber is determined by those basic properties or characters of the wood or of the tree which we have already mentioned. The actual properties or characters favored depend on the uses to which the wood is put. The second category is less demanding and is not much concerned with characters of the tree itself; the only things that matter are certain properties or characters of the wood—for instance, density and nature of fiber walls in the case of pulp manufacture.

To the forester, "quality" is a subtle mixture of fine appearance and value. As regards value, he is more concerned with the value of the standing trees than with the value of the harvested timber. But, generally, the forester cannot help associating value with the general aspect of the forest crop.

It is to a great extent common sense, since pleasing appearance in itself presupposes certain basic characters, and an assurance that the individual trees will yield valuable products. But where there are no close working contacts between the forester and those who have to use the timber which he produces, the forester perhaps appears inclined to attach more weight to the fine appearance of his forest than to the value of its products. Such an attitude cannot be justified today. The forester must adapt his methods of management so as to produce the amounts and kinds of forest products needed by industry. The "beautiful forest" can no longer suffice as an end in itself; the forest must be capable of yielding the raw material most useful to the industries which depend upon it.

Diameter quality

Of all the factors which help to determine the value of the products of a tree, diameter is the one which can be appreciably modified by the forester.

Diameter has always been considered as a fundamental characteristic of quality. Apart from special cases, it still remains a basic element of forest management, in that a certain diameter is usually prescribed up to which trees are to be allowed to grow before being felled. Although under certain methods of management no fixed rotation or exploitable size is prescribed, it is nevertheless implicit that the aim of management of productive forest is to grow trees of the most economic size from the commercial standpoint.

The importance of diameter is easily explained. Once the species or several species required for a particular use have been selected, and so long as the timber is to be used in solid form, the principal element still remaining to be decided is the diameter limit, minimum or maximum or sometimes both, to be laid down for the trees destined for this use.

Except for certain special uses, such as pitprops, poles, or piling, trees of greater diameter are generally considered to be of higher quality. A tree of large diameter lends itself to a much greater variety of uses than a small-size tree. On the saw bench, in particular, large trees convert to greater advantage than small trees. Taking a combination of both chemical and mechanical utilization, the range of end products obtainable from a large tree is obviously greater than from a small tree.

Moreover, limiting the argument to mechanical utilization alone and especially the production of sawn lumber, the proportion of wastage is less from big trees than from small. Other things being equal, then, the tree of larger diameter is generally considered of better quality.

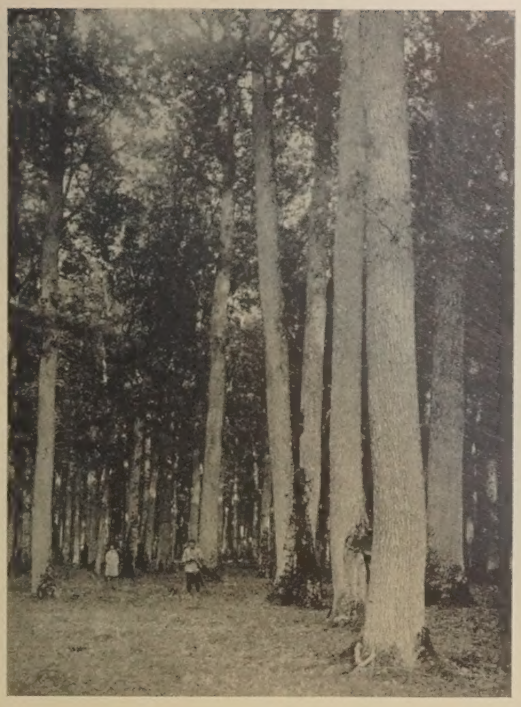
The forester must obviously limit the diameter of the trees which he grows, either because the interest earned on the capital value of his crop declines after a certain age, or because he fears that overmature trees will decay, or because of the physical difficulties entailed in logging and extracting big logs. It is none the less true that at the mill large logs are generally graded as higher quality than small-diameter logs.

Future requirements of the wood-using industries

The purpose of the paper submitted by FAO to the Helsinki Congress was to try to evaluate the probable nature of the future requirements of the wood-using industries. Its conclusions were corroborated in a similar paper submitted by Professor Streyffert, of Sweden.

Both papers supported their arguments with statistics, although it may be safer to base forecasts of future trends on laboratory and industrial research and other experimental work. The conclusions of these two papers can hardly be disputed in the light of what is happening in the research world.

These conclusions may be briefly summarized as follows: While the volume of wood required from our forests by industries processing timber in solid form remains constant or increases only gradually, indus-



A fine stand of oaks (Quercus robur), *180 years old, in a French forest.*

tries based on "disintegration" processes (mechanical or chemical) will be wanting an ever larger quantity of raw material. In other words, the proportion of the annual world forest output utilized in a "disintegrated" form will progressively increase over the next decades.

The additional quantities of raw material required by the "disintegration" industries will not be secured at the expense of the other wood-using industries; they will mainly be obtained by increased exploitation of species hitherto of no economic value and of trees and logs now abandoned in the forest, and by utilization of conversion waste which is at present discarded or used as fuel. In other words, what was "waste" will in future have value.

More wood, formerly treated as waste, and more species not hitherto marketable, are already in demand for a large variety of industries, and their value is rising. In fact, there is a definite tendency in some places for the value of so-called "waste" species and wood waste to approach the value of the supposedly principal products. This is inevitable when the requirements of the industries using wood for "disintegration" processes are increasing proportionately more rapidly than the requirements of the industries converting solid timber. It is already clearly manifest in many parts of the world where pulp factories and sawmills must obtain their raw material supplies on the same markets. The raw material for industries based on disintegration processes generally represents a relatively small portion of the cost of the final manufactured product; these industries can therefore pay

Where silviculture is designed to favor the growth of individual trees. A mixed broadleaved stand in a Michigan forest, U.S.A.

high prices in competition with other wood-using industries.

The significance of these trends for the forester

How will the changing requirements of the wood-using industries affect the forester? There are two principal conclusions.

First, the greater possibilities for the utilization of material and species not hitherto extracted will lead the forester to revise his ideas on the growing stock to be included in the composition of his forest stands. This more intensive utilization is not at present significant in terms of volume, but it may soon become so. For instance, there is the progress made in the utilization of soft wooded broadleaved species and even of hard wooded species in pulp manufacture. Experiments carried out in using mixtures of tropical woods for pulp manufacture, as described at the Montreal Pulp Conference in May 1949, cannot be ignored. Furthermore, it is not only the industries using disintegration processes which may extend the range of their raw materials; the instance of the "true firs" and hemlocks of the west coast of North America proves that this may also happen in the case of lumber. It only awaits new methods of drying, storage, and preservative treatment. Many tropical species may also become better appreciated so as to give real value to additional large quantities of wood on local, regional, or world markets.

Second, the greater utility and value accorded to so-called "waste" will make foresters tolerate a greater proportion of small-size trees in their stands, and lead them to lower felling limits. This will probably become normal practice. In fact, self-interest in forest management will make it inevitable. The greater quantities of smaller trees will find a ready outlet even if the sawmills do not use them; and there will be no need to continue to grow trees as large as before because there will be a ready sale for conversion waste.

Both these conclusions are in keeping with the declared aim of the member governments of FAO—to secure a more efficient and complete utilization of the raw material which the forest provides, and thereby to ease the world shortage of wood.

Silvicultural consequences

In the first place, the trend towards "quantity" production, as reflected in the increase in the number of species which industry can utilize, will make it easier for foresters to adapt their crops to local environmental conditions.

At the Helsinki Congress, the need to plant pure forests of coniferous species was often stressed, mainly by foresters of Mediterranean and Western European countries, on the grounds that only such uniform crops can properly fulfill industrial requirements when the species occurring naturally are to all intents

and purposes unusable. It is well understood that the establishment of such plantations entails certain risks; the way to obviate these is in many cases through the introduction of other species, either to create a mixed growing stock or to provide a soil-enriching understory under the main coniferous crop. These supplementary species at present may not have a market value, even though they have a recognized silvicultural value, and the normal objection to such a course is that it requires an investment of capital without any appreciable financial return. However, if the new species can be turned into a cash crop, then this type of operation may more readily be applied.

Pursuing the same line of thought, the day may come when financial considerations will no longer prevent the forester from growing crops which are properly in harmony with the ecological environment of the locality. A forest of such a type would naturally be easier to grow and be less subject to many natural hazards than purely exotic stands. It might possibly, however, be less productive, in terms of quantity, and it is not safe to predict how silviculture would develop under such circumstances; no doubt practices would vary from one locality to another.

In any case, far from resulting in the demise of the art of silviculture, the trend toward "quantity" production should promote sound silvicultural methods and favor the growing of good types of forest stands.

Another consequence of the trend towards "quantity" production will probably be a lowering of the diameter limits at which trees are felled. This, again, should be conducive to the practice of better silvicultural methods and the establishment of high quality stands.

For instance, the chief obstacle at present to the carrying out of regular thinnings, which are necessary as a means of promoting both quantity and maximum quality in the final crop, is the fact that it is often impossible to dispose profitably of the smaller trees taken out during the thinning operations. Should these trees, however, command a ready sale, this obstacle would be removed, and the practice, which is now practically unknown over wide forested areas of the world, could become economically feasible. The value of the produce extracted would justify the maintenance of road networks and the organization of the necessary cutting operations.

This is not all. Under present circumstances, the forester is often obliged to maintain an even-aged crop beyond the point of culmination of the current annual growth, at which stage a progressive diminution in current increment sets in. In other words, with a lengthened rotation he has to be satisfied with a smaller mean annual growth than could be obtained if the crop were cut at the most advantageous age and immediately replaced by young trees. Due to the special value attached to diameter quality, the rotation

The volume of pulpwood cut in Canada rose from about 1¼ million m³ in 1900 to around 29 million m³ in 1946, when it constituted 32 percent of the total annual cut. The percentage is still rising.

affording the greatest average net annual money yield is longer, and for some species much longer, than the rotation for maximum current annual growth.

Obviously, therefore, any trend in wood utilization which enhances the value of smaller diameter trees encourages the application of sounder silvicultural practices and the growing of better stands. The stands will be better not merely because they will reach the maximum point of increment and go no further, but because they will be less susceptible to disease, insect attack, and wind damage, if felled before they are on the decline.

It is a moot question whether the crops of the future will be any the less excellent or less beautiful than the forests of today merely because they contain fewer large trees. In general, an abundance of large trees does not in itself contribute to the so-called "beauty" of a forest unless these large trees really are of peculiar value because of their size; this does not imply that they should be systematically eliminated.

It seems fairly well established that we shall rarely again find "quality" such as is represented by the enormous trees now being exploited in the last virgin forests of the western coast of North America. The kind of lumber or plywood derived from Douglas firs or Sequoias several hundreds or thousands of years old will probably never be seen again, because it seems unlikely that anyone would attempt to maintain standing timber in a managed forest until it had reached such an advanced age, save in the most exceptional cases.

Quality and quantity in forest stands

The probable trends in wood utilization need not make the forester alter his concept of the forest of pleasing appearance; they will rather stimulate the growing of excellent forests.

We said earlier that the forester was apt to couple the outward appearance of the forest with the concept of the value of the products of the forest. It must be conceded that "beauty" of a forest is generally more an index of high productivity than of utility. Leaving aside any question of felling diameter, which the forester is usually free to decide for himself, the selection of the single or several species to constitute the growing stock determines to a great extent the uses of the products. We have already said that there is no precise knowledge as to the effect silvicultural operations may have on the basic properties of wood itself. Therefore the forester's object must be to achieve, within the limitations imposed by nature, the highest possible output and he will direct his silvicultural operations to this end. For the forester, the elite tree is obviously one which supplies useful products; but it is primarily the one which will yield an above average quantity of these products.

"Diameter quality" has been left out of consideration in the preceding argument, and it might be objected that large trees are often conserved, despite a slowing down in the increment rate, so as to get a better quality of product rather than a greater quantity. It is true that in such cases the concept of enhancement of value replaces that of greater quantity. But at the same time such methods of silviculture are difficult. If the rotations to attain both maximum quantity and value could be made to coincide, management of the forest would be greatly facilitated without either "beauty" or "quality" being sacrificed. On the global scale, it is precisely this trend which appears to be developing.

The ideal forest crop

Before considering the world market, the forester must consider the demand in his own locality. It may therefore be asked whether in the event that he decides to lower felling limits, he will not run the risk of limiting the size and grade of product which he can offer on this market.

Will this not lead to local upsets, which could be avoided by more progressive local action, even though the global trend is inescapable? In other words, is there not a danger, even if we again stress we are generalizing, that the mere statement that there is this trend will lead foresters to try to establish more uniform types of crop, whose output will furnish supplies for some industries but fail to satisfy the raw material needs of others? Is it not contradictory to foster the idea of integrated forest industries while recommending steps which might render it difficult to supply certain industries that should constitute an integral part of such a set-up?

The paper submitted by FAO to the Helsinki Congress attempted to obviate just such a reproach by suggesting that present trends in the requirements of wood-using industries made it advisable, whenever possible, to cultivate mixed uneven-aged forests rather than uniform, even-aged types. Preference was expressed for what might be termed a silviculture looking towards the growth of individual trees rather than the growth of the stand as a whole.

Even where this kind of silviculture is possible—and it cannot always be possible—it is assuredly the more difficult to carry out successfully. It involves complex methods of management and continuous control of the forest, which is not practicable without a large staff, an adequate network of roads and paths, an effective fire-fighting system, and a grouping of industries capable of absorbing all the produce of the forest. However, as an ideal, it is the most flexible means of adapting forest production, not only to the special needs of industries, but also to changes in their requirements.

When a certain industry needs particular species or very large diameter trees from a forest managed in this way, the desired species can be favored or selected trees left to grow to the required diameter. When the demand from this particular industry falls off, the proportion of the particular species in the growing stock can be changed or the maximum felling limit reduced. This can be done without drastic treatment of the forest or any serious modification in the working plan, and without any interruption in the supplies to other industries.

Were such a system of silviculture universally adopted, it might be virtually unnecessary to worry further about trends in wood-using industries, because the adaptation of forest production to industrial requirements would be practically automatic. Unfortunately, we are still very far indeed from such an ideal state of affairs, and, as we have just stated, such a system presupposes a harmonious development both of silvicultural methods and forest industries,

which cannot be expected to come about quickly. It is nevertheless true that the present trend in wood requirements logically favors such a development.

Conclusion

The conclusion of this paper is that, from the silvicultural standpoint, there are no valid grounds for an assumption that quantity production will displace quality production. For the future, as in the past, a fine-looking tree and a fine stand will have to measure up to certain standards which are a sign of high raw material output of the desired quality. Although on the global scale the requirements of the wood-using industries appear to be for "quantity" rather than "quality," this does not in any way lessen the need for effective and improved silviculture. The trend may, and probably will, necessitate more or less extensive local adjustments. But such adjustments need not cause the forester to alter his ideal of a high-quality forest. Rather, quantity and quality production will go together as a means towards wood abundance and economical silviculture.

No strict rules can, of course, be laid down for foresters as to the course which they should follow in view of probable wood utilization trends. Not only is there room for much latitude in the light of local conditions, but naturally each country will define its own policy, co-ordinating this policy with that of other countries of the world through the medium of FAO and its regional bodies.

The Division of Forestry and Forest Products seeks to point out the trends as they emerge from statistics and general thinking, and to deduce from them consequences of world-wide import. That is what was attempted in the paper presented to the Third World Forestry Congress, and what is again attempted here.

Photographs in this article by courtesy of: U.S. Forest Service (pages 50 and 54), French National Forest School (page 53), National Film Board of Canada (page 55).

Forest Resources of the World

Supplementary Data to the Original FAO Study

IN 1947 FAO undertook an investigation into the forest resources of the world. Special questionnaires, designed with the help of two international conferences on forest statistics, were sent by the Director-General to all countries. The results of the inquiry were published in UNASYLVA, Volume II, No. 4, July-August 1948.

Since that date, several countries which were not then in a position to provide the desired information have returned their inventory questionnaires to FAO. In order that all those interested may have access to these valuable additional data, they are presented in the following tables, which correspond to Tables 4-10 in the original study. Replies received from countries included in the earlier report, plus those now reported, cover two-thirds of the land area of the world.

While FAO's inquiry has resulted in the collection of a useful series of relatively comparable statistics, it has also served to emphasize the great need in many countries for far more complete information than exists at present regarding the extent and composition of forest resources. FAO is now preparing a booklet on the planning of national forest inventories, which, it is hoped, will be useful to national authorities who may be required to organize large inventory projects, perhaps for the first time.

As FAO intends to undertake a further inquiry into world forest resources within a few years, attention must also be given to revising and improving the inventory questionnaire. The regional Forestry and Forest Products Commissions which have been established by FAO will, it is hoped, be able to give valuable advice on this subject.

TABLE 1.—LAND CLASSIFICATION*

Continent and Country	Population	Total Land Area	Forested Land					Cultivated Lands and Grasslands		Other Lands	
			Productive Forest		Other Forest	Total Forest		Area	Percentage of Total Area	Area	Percentage of Total Area
			Area	Per Caput		Area	Percentage of Total Area				
EUROPE	*Millions*	*1,000 ha.*	*1,000 ha.*	*ha.*	*1,000 ha.*	*1,000 ha.*	*Percent*	*1,000 ha.*	*Percent*	*1,000 ha.*	*Percent*
Italy	45.7	29,375	5,615	0.12	358	5,973	20	20,595	70	2,807	10
AFRICA											
Algeria	8.7	190,000	1,906	0.22	1,079	2,985	2	10,000	5	177,015	93
British Somaliland	0.7	17,612	518	0.74	—	518	3	32	...	17,062	97
Ethiopia	15.0	106,000	1,150	0.08	—	1,150	1	70,000	66	34,850	33
Northern Rhodesia	1.6	74,498	5,440	3.40	33,410	38,850	52	...		[1]35,648	48
South-West Africa	0.4	82,288	5,176	12.94	—	5,176	6	[2]71,903	87	5,209	6
ASIA											
Turkey	19.5	75,744	10,000	0.51	—	10,000	13	46,042	61	19,702	26
South Korea	15.0	16,050	6,420	0.43	...	...	...	...	...	...	...

*Corresponding to Table 4, UNASYLVA, Vol. II, No. 4 (July-August 1948).
— None.
... Not available.
[1]Includes cultivated lands and grasslands.
[2]Includes savannah with scattered trees.

TABLE 2.—CLASSIFICATION OF PRODUCTIVE FORESTS*

Continent and Country	Total Productive Forest	Accessible Forests				Inaccessible Forests			
		Coniferous	Broad leaved	Mixed wood	Total	Coniferous	Broad leaved	Mixed wood	Total
	1,000 hectares								
EUROPE									
Italy	5,615	1,000	4,342	224	5,566	31	18	—	49
AFRICA									
Algeria	1,906	638	995	2	1,635	151	118	2	271
Ethiopia	1,150	—	—	150	150	—	—	1,000	1,000
Northern Rhodesia	5,440	—	260	—	260	—	5,180	—	5,180
South-West Africa	5,176	—	130	—	130	—	5,046	—	5,046
ASIA									
Turkey	10,000	1,800	1,000	200	3,000	4,200	2,000	800	7,000

*Corresponding to Table 5, UNASYLVA, Vol. II, No. 4 (July-August 1948).
— None.

TABLE 3.—OWNERSHIP OF PRODUCTIVE FORESTS*

Continent and Country	Total Productive Forests	Publicly Owned Forests				Forests Owned by Institutions	Privately Owned Forests
		State Forests		Communal Forests	Total Public		
		Fellings Permitted	Fellings Prohibited				
	1,000 hectares						
EUROPE							
Italy	5,615	141	—	1,570	1,711	308	3,596
AFRICA							
Algeria	1,906	1,485	27	110	1,622	—	284
South-West Africa	5,176	—	1,860	[1]3,186	5,046	—	130
ASIA							
South Korea	6,420	[2]1,433	...	...	1,433	...	4,987

*Corresponding to Table 6, UNASYLVA, Vol. II, No. 4 (July-August 1948).
— None.
... Not available.
[1]Reserved for benefit of native tribes.
[2]Includes all State forests.

TABLE 4.—GROWING STOCKS IN ACCESSIBLE PRODUCTIVE FORESTS*

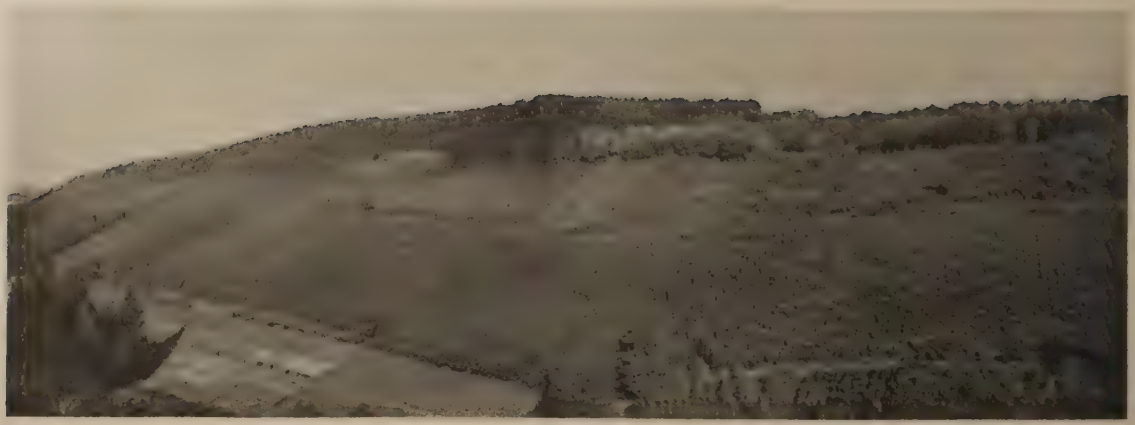
Continent and Country	Total Volume			Average Stand per Hectare		
	All Species	Conifers	Broadleaved	All Species	Conifers[1]	Broadleaved[1]
	Million m^3 (r)			m^3 (r)		
EUROPE						
Italy	299	104	195	54	94	44
AFRICA						
Algeria	20	9	11	12	14	11
Northern Rhodesia[2]	3	—	3	11	—	11
South-West Africa[2]	3	—	3	25	—	25
ASIA						
Turkey	159	94	65	53	50	59

*Corresponding to Table 7, UNASYLVA, Vol. II, No. 4, (July-August 1948).
— None.
[1]Based on areas actually bearing these species. One-half of the mixedwood areas reported in the table "Classification of Productive Forests," is treated as coniferous and one-half as broadleaved.
[2]Commercially exploitable species only.

TABLE 5.—AVERAGE ANNUAL GROWTH AND ANNUAL DRAIN*

Continent and Country	Accessible Productive Forests						Average Annual Fellings Outside the Forest	Total Growth in Inaccessible Forests
	Total Annual Growth		Losses from Natural Causes	Net Annual Growth	Average Annual Fellings	Balance + or —		
	Volume	Per Hectare						
	1,000 m^3 (r)	m^3 (r)	*1,000 m^3 (r)*	*1,000 m^3 (r)*	*1,000 m^3 (r)*	*1,000 m^3 (r)*	*1,000 m^3 (r)*	*1,000 m^3 (r)*
	ALL SPECIES							
EUROPE								
Italy	11,600	2.1	300	11,300	13,200	—1,900	1,360	—
AFRICA								
Algeria	767	0.5	67	700	826	— 126	...	100
Northern Rhodesia[1]	28	0.1	3	25	85	— 60	...	370
South-West Africa[1]	33	0.3	1	32	16	+ 16	286	...
ASIA								
Turkey	3,240	1.1	60	3,180	3,160	+ 20	...	...
	CONIFEROUS FORESTS[2]							
EUROPE								
Italy	1,600	1.4	110	1,490	1,900	— 410	60	—
AFRICA								
Algeria	301	0.5	51	250	276	— 26	...	70
ASIA								
Turkey	820	0.4	50	770	800	— 30	...	...
	BROADLEAVED FORESTS[2]							
EUROPE								
Italy	10,000	2.2	190	9,810	11,300	—1,490	1,300	—
AFRICA								
Algeria	466	0.5	16	450	550	— 100	...	30
Northern Rhodesia[1]	28	0.1	3	25	85	— 60	...	370
South-West Africa[1]	33	0.3	1	32	16	+ 16	286	...
ASIA								
Turkey	2,420	2.2	10	2,410	2,360	+ 50	...	...

*Corresponding to Tables 8, 9, and 10, UNASYLVA, Vol. II, No. 4 (July-August 1948).
— None.
. . Not available.
[1]Commercially exploitable species only.
[2]Based on areas actually bearing these species. One-half of the mixedwood areas reported in the table "Classification of Productive Forests" is treated as coniferous and one-half as broadleaved.



Experiment station at Royat (Puy de Dôme). Many species are tried out here; in particular, numerous strains of Scots pine (Pinus sylvestris).

Organization of Research in France

I. Forest Research

By R. C. ROL, Professor, National School of Waters and Forests, Nancy

FOR a very long period of time the forests in France were exploited as need arose and were often totally destroyed; only hunting preserves reserved for the nobleman who owned the forest were under any kind of management. In those days the forester played mainly a police role. But as the need for wood constantly increased, while the forested area dwindled, the restrictive character of his functions became accessory, and the forester became a technician charged with the development of the forest domain. An art of forestry grew up, comprising all the techniques of cultivation and exploitation, at first based on purely empirical methods but, as time went on, increasingly founded on precise and scientific observation.

But simple observation, often deceptive in biology, can be particularly difficult in the case of trees, for the factors which influence the life of the forest are many and complex and they often react upon one another in a very unexpected manner. Analysis of these factors demands a highly developed critical sense and always contains a large percentage of personal interpretation. Furthermore, observation itself in the forest is attended by many inherent difficulties, owing to differences in the morphological and physiological characteristics of trees, in their longevity, in their capacity for growth, and in the durability of their wood tissues.

French foresters very soon realized that observation, though useful, was only the beginning and that research was necessary to solve many of their problems. But, unfortunately, forest research encountered the same difficulties as observation, so that the lone experimenter often became discouraged by material difficulties arising from the size of the trees, the physical properties of wood, and the lapse of time that was necessary before any conclusion could be reached.

Historical Development

Forest research involves teamwork and can be undertaken successfully only by a specialized organization which assures the continuity necessary to experimentation. It was only at a relatively recent date, the end of the nineteenth century, that the necessity to create such a specialized organization, the Forest Research Station, became felt in France.

Nevertheless, it would be unfair not to mention those who, at the end of the eighteenth century and the beginning of the nineteenth, attempted the first forestry experiments: Duhamel du Monceau (1700-1782), Varenne de Fenville (1700-1793), and, most important of all, Philippe André de Vilmorin. It was de Vilmorin who, from 1821 to 1862, organized on the Domaine des Barres, which is now State property, the first experiments on different methods of tending certain forest trees such as Scots pine (*Pinus sylvestris*), Laricio pine (*Pinus nigra* var. *calabrica*), and American oak. These experiments still serve as models, and conclusions can still be drawn from them.

Forest research in France properly dates from the setting-up of the Forest Research and Experiment Station (Station de recherches et expériences forestières), established by departmental order of 27 February 1882 as an annex to the National School of

Waters and Forests (Ecole nationale des Eaux et Forêts). Its beginnings were modest, for until 1914 the funds at its disposal were very small. The staff consisted of one or two forest officers, whose field of action was necessarily confined to those forests in the vicinity of Nancy which were directly under the control of the School. As a result, research was limited exclusively to forestry questions or to questions directly bearing on the forest, such as forest meteorology. Mention might also be made of research work undertaken during this period (1882-1914) on the effects of thinning, which was begun by Bartet and continued by E. Mer and Cuif.

As early as 1866, Mathieu, Professor of Natural Sciences at the School, had set up a series of meteorological posts with the aim of conducting research on the influence of the forest on climate. These studies were continued and extended by the officers of the Research Station, and the results, which are now universally accepted, were published.

It was natural that the professors of the School should participate very largely in the work of the Research Station: Henry was a pioneer in agricultural soil science, but he also worked on various questions of forest pathology and tree protection. In 1897 Thiery and Petitcollot published the results of their experiments on the resistance of certain tree species to disease. De Bouville worked mainly on fish culture. responsibility for inland waters being vested in the Administration of Waters and Forests.

Organization and Program

After World War I the Research Station had to be reorganized, as the greater part of its records had been destroyed. A departmental order of 15 June 1920 made it possible to enlarge the field of research very considerably.

Four branches were set up. The first, headed by an inspector, was responsible for the management of the forests under the School's administration and for general forest research; the other three branches were put under the direction of the professors in charge of the corresponding fields of instruction: botany, zoology, headwaters protection.

This arrangement was continued for 17 years, and during this time research progressed vigorously. In 1937 a complete reorganization was effected by M. Guinier, then Director of the School, and approved by departmental order of 29 December 1937, increasing to seven the number of branches of the Research Station. Since that date this arrangement has remained unchanged except for a few minor details.

The first branch, which is now under the direction of a conservator, continues to work on general forest research and to manage the School's forests. Its principal task is the systematic study of growth, and the development and wood increment of the principal forest species of France. This work is carried out on sample plots which have been established in as many different stations as possible, with various environmental conditions. Detailed measurements are taken at regular intervals. Unfortunately, World War II profoundly upset this plan, but order is now being restored. Moreover, these are long-term experiments and, though figures accumulate, recognizable results are still a long way off.

As a knowledge of local climate, macroclimate and microclimate, is an indispensable factor in carrying on the work of forest research, a number of meteorological observation posts of interest to forestry were installed in 1939; but they ceased functioning during the war, and for economic reasons can only slowly be reinstated.

Apart from these purely forestry subjects, the first branch also devotes special attention to the tapping of Maritime pine (*Pinus pinaster*) for resin. An important report was published on this subject in 1938. At present, activation of the production of pine-resin by sulphuric acid is being studied.

The second and third branches, which are under the direction of the professor of forest botany, deal with all research which has a bearing on that subject. But while the second branch works on forest botany in general — the anatomy and morphology of fibrous plants, systematology, botanical geography, plant pathology, etc., as applied to forestry — the third branch is mainly concerned with artificial regeneration in its widest sense, from the ecological and genetic study of plants which can be put to use to the material execution of work on the plantations, including harvesting of seed and care of nurseries. It also manages the arboretums which are attached to the School.

The fourth branch, directed by the professor of technology, conducts research from a forestry angle on forest exploitation and the rational utilization of wood. It co-operates with the Central Timber Testing Laboratory in Paris, which comes under the Department of Waters and Forests, and carries out, from the industrial aspect, all technical research on the physical, chemical, and mechanical properties of wood and on wood preservation.

The fifth branch, under the professor of pedology, studies all questions relating to forest soils. The importance of pedology in modern forest science increases every day, and one of the most arresting problems of forest life is the complex relation existing between variations in soil and the evolution of tree associations. Recently a report on local conditions was made on this subject by one of the officers of the Research Station.

The sixth branch is in charge of work on forest zoology, and at present its activities are directed mainly toward the elimination of various insect pests which lay waste our forests. It also studies hydrobiology and agriculture in co-operation with the Central Station of Applied Hydrobiology in Paris, and as a result has the use of the Hydrobiological Establishment at Aix-les-Bains, on the border of Lac du Bourget in Savoy. Since 1920 this branch has published various studies on forest entomology and hydrobiology.

The seventh branch has charge of studies on mountain economy. Actually it is in the mountains, principally where climatic conditions are difficult, as in high mountain regions or in the Mediterranean mountains, that the forest forms the essential element in economic stability. So the mountain forester must take into account not only the forest itself but also all other problems of these regions, and must work in close co-operation with others interested in the same problems, especially with geographers. The seventh branch also takes care of soil conservation, reforestation of mountain country, rangeland management,

protection against avalanches, and glacier and rainfall studies in the mountains. This is a very large program, and the branch has altogether insufficient funds at its disposal.

A description of the work accomplished by the officers attached to the Research Station is published in the Annals of the National School of Waters and Forests. Since 1924, 23 volumes have appeared. Less important articles have appeared in various French forestry reviews. Through exchanges, the library of the School receives publications from similar organizations abroad.

Economic conditions are constantly changing, and the fundamental sciences on which the forestry sciences are founded have made rapid progress in these last years. Consequently, new problems are continually arising, problems of such complexity that they require greater specialization and more efficient working methods than are at present possible. Satisfactory solutions would necessitate a reorganization of the Research Station on an entirely new basis with a considerable increase in the number of research workers and more modern equipment.

Research Problems in the Indigenous Forests

It is impossible in an article of this length to describe in detail the many problems that the Research Station must try to solve more or less rapidly.

From a silvicultural point of view, following the decline in demand for fuelwood and the increasing demand for softwood, the improvement of coppice and of coppice with standards, which composes a large part of the French forest, has become indispensable. This improvement will have to be made by the introduction of a considerable quantity of new species. This has given rise to many problems either purely scientific or purely technical, such as production, harvesting, preservation of forest seeds, mechanization in the nurseries and work on the plantations, elimination of various enemies of young plants such as fungi, insects, rodents, weeds, etc. The creation of a more intensive silviculture is impossible without thorough ecological research on climate, soil, and the biocoenotic systems, or without taking into account the present genetic factors—that is to say, without practicing selection. This is a wide field of research which is still relatively unexplored.

The forests of the Landes have suffered considerable damage from the war and from a succession of dry seasons. Their restoration must be considered from a new angle, especially as regards fire protection, and different methods will have to be tried. The Research Station cannot ignore this all-important question in the national economy, and experimental machinery suitable to deal with the problem must be considered as soon as possible. Fire fighting is of concern not only in the region of the Landes but also in the Mediterranean area and even in many of the forests of central and western France; but fire-fighting systems should vary according to the needs of the region. Consequently, research should be spread over these various regions.

Until recently experiments at the Research Station have been limited to the so-called forest trees; but there are also trees which are not generally considered part of the forest but which nevertheless produce a large amount of timber, such as the chestnut and poplar. The Department of Waters and Forests very rightly considers that at the present time these two species cannot be ignored. Two special commissions, composed of experts, have been set up to co-ordinate all efforts directed at the creation of new poplar plantations and the restoration of chestnut plantations. The technical secretaries of these commissions have been assigned to the Research Station of the School, where they will be responsible for collecting the documentation and carrying out the necessary experiments. A "populetum" which will group together almost all the types of poplars which are cultivated today is being established at Vineuil in the valley of the Loire and will permit interesting comparisons.

The questions of soil conservation and mountain reforestation also bring many pressing problems, but space is too limited to pass them in review. It is necessary, however, to mention the millions of hectares in the southern Alps reforested in black pine (*Pinus nigra*), the planting of which was begun in 1860. These trees are now approaching maturity, and the question arises as to whether regeneration can be secured or whether a different species must be introduced to assure the continuity of the forest. The answer to this question will depend on the environmental conditions under which each reforestation project is to be carried out and will vary accordingly. Experiment centers must be established and should be accompanied by systematic phytosociological studies.

It is evident that under present conditions a research station cannot live an isolated existence; close relations must be established with other similar organizations and there must be frequent contacts between technicians in the interests of forest research. These contacts existed before 1939 under the auspices of the International Union of Forest Research Organizations (Union internationale des Stations des Recherches); but they were naturally suspended during the period of hostilities and, owing to the difficulties of postwar life, can be renewed only slowly. Nevertheless, in 1948 an officer of the School was able to go to Sweden, and he brought back with him many interesting documents, mainly on genetic research which has been studied in that country for a long time. Another officer traveled through the forests of North America, mainly in the coastal chains of the Pacific, whence most of our more important exotic species come. At different times contacts have been made with Swiss colleagues on questions concerning bark-borers, the struggle to reduce mistletoe, the systematic study of snow in high mountains, etc., and it is hoped that during the years to come these very necessary contacts will be increased.

In spite of its present limited staff, the Research and Experiment Station of the Forestry School has tried to attain the goal which was set for it: "to advance the various sciences which concern forest instruction and to give to the forestry staff, as well as to individuals, scientific information and advice." It is to be hoped that its means of action will soon be largely augmented and that it will be able to carry out experiments on a scale befitting a country where the forest plays an important part in the general economy and where even now important reforestation work is being carried to fruition, thanks to the National Forestry Fund.

BIBLIOGRAPHY

DUCHAUFOUR, PH. Recherches sur la chênaie atlantique fran-
1948 çaise (Research on the oak groves of the Atlantic coast of France). Annales de l'Ecole nationale des Eaux et Forêts. Vol. 11, Section 1. 332 pp.

GUINIER, PH. La Station de recherches et d'expériences for-
1932 estières de l'Ecole nationale des Eaux et Forêts — Douze années d'activité, 1920-1931. Académie d'agriculture de France — séance du 9 mars 1932. (The Forestry Research and Experiment Station of the National School of Waters and Forests: Twelve years' work, 1920-31. The French Academy of Agriculture — Meeting of 9 March 1932.) 10 pp.

OUDIN, A. Vues d'ensemble sur l'organisation en France des
1930 recherches de sylviculture et d'économie forestière: Les méthodes (Composite picture of the organization of research on silviculture and forestry economy in France: Methods). Annales de l'Ecole nationale des Eaux et Forêts. Vol. 3, Section 2, pp. 231-62.

OUDIN, A. Etude sur le gemmage des pins en France (A study
1938 on the tapping of pine trees for resin in France). Annales de l'Ecole nationale des Eaux et Forêts. Vol. 7, Section 1, pp. 169-287.

PERRIN, H. Les recherches forestières en France (Forestry
1928 research in France). Annales de l'Ecole nationale des Eaux et Forêts. Vol. 2, Section 1, pp. 139-54.

ROL, R.; POURTET, J.; AND DUCHAUFOUR, PH. Catalogue des
1944 espèces cultivées dans l'Arboretum des Barres (Catalogue of species cultivated in the Arboretum of Barres). Annales de l'Ecole nationale des Eaux et Forêts. Vol. 9, Section 1. 230 pp.

SCHAEFFER, L. L'Expérimentation forestière — Comptes rendus
1938 du premier congrès lorrain des Sociétés savantes de l'Est de la France, Nancy, 6-8 juin 1938 (Forestry experimentation — Minutes of the meetings of the First Lorraine Congress of the Scientific Society of Eastern France, held at Nancy, 6-8 June 1938). 6 pp.

II. Forest Products Research

By M. VILLIÈRE, Inspector of Waters and Forests at the Central Timber Testing Laboratory, Paris

FRANCE has a long tradition of research in the field of wood technology. As long ago as 1707 Parent published a treatise entitled *Expériences sur la résistance des bois de chêne et de sapin* (Experiments on the qualities of oak and fir woods). A little later, in 1767, Duhamel du Monceau, Inspector-General of the Royal Navy, published his famous work, *Du transport, de la conservation et de la force des bois* (On the transport, preservation, and strength of wood), which is without doubt the first important book on these questions and marks the beginning of scientific study of wood as a raw material. In the nineteenth century we find the names of Dupin—*Expériences sur la flexibilité, la force et l'élasticité des bois*, 1815 (Experiments in the flexibility, strength, and elasticity of wood)—and Chevaudier and Wertheim—*Mémoire sur les propriétés mécaniques des bois*, 1846 (Report on the mechanical properties of wood).

It was not until the twentieth century, however, that wood research was organized on a national scale. In the time of Duhamel du Monceau research was directed to the use of wood for the Navy, but it was wood for aeronautics which was finally responsible for the creation of the first wood research laboratories in France. As an exceptionally light material with the maximum physical and mechanical toughness was necessary for this use, a systematic testing of all species was initiated. The name of Monnin is associated with these early studies, which took place during World War I, and the methods he established have become those universally accepted in France.

After this rapid glance into the past, we shall pass on to the present organization of wood research in France. The Administration of Waters and Forests (Administration des Eaux et Forêts) was the first to develop research on a national scale; and though its initiative was followed by other official and private organizations, it is still the leader in this field and devotes a higher percentage of time and money to these studies than do other organizations.

We give below particulars on various existing organizations, distinguishing between those which fall under the General Directorate of Waters and Forests, and others which, under various titles, are occupied with wood or cellulose research.

ORGANIZATIONS UNDER THE GENERAL DIRECTORATE OF WATERS AND FORESTS

In 1920, at the instigation of its Director, M. Guinier, the National School of Waters and Forests (Ecole nationale des Eaux et Forêts) set up a wood-testing laboratory as an adjunct to the Forest Research and Experiment Station. This laboratory is devoted to the study of forest products in relation to conditions of growth.

In 1933 the Administration of Waters and Forests and the principal professional organizations, in collaboration with the Service of Technical Instruction (Enseignement technique), established a semi-official organization to promote research on wood and its utilization as well as technical instruction on wood. It is called the National Timber Institute (Institut national du bois).

A little later, in 1936, the Administration of Waters and Forests also set up the Central Timber Testing Laboratory (Laboratoire central d'essais des bois) and equipped it for the complete study of wood and its utilization possibilities.

This combination is now proving satisfactory.

The *School for Advanced Study of Wood* (Ecole supérieure du bois) in Paris is responsible for training technicians and engineers specializing in wood studies. Wood industries recruit many of its graduates as their need for technical specialists is steadily increasing, and at present about three hundred persons who have been trained here are scattered throughout French industry. The school has now about a hundred students who, during a two years' course, receive specialized instruction in the study of wood, its processing, and its application in industry.

The *School for Wood* at Mouchard in the Jura (Ecole du bois de Mouchard) trains skilled personnel for timber cutting and sawmill operations, clerks, and foremen who are experts in the maintenance of saws, the use of power (forestry) machinery, and the grading and cutting of timber, etc. It also provides special courses for the speedy training of saw filers.

The *Central Timber Testing Laboratory* (Laboratoire central d'essais des bois) in its three specialized sections—biological, mechanical and chemical—makes a general study of wood as a construction material and as a raw material. The *Laboratory of the National Timber Institute* (Laboratoire de l'Institut national du bois), which is attached to it has set up a *Section of Industrial Applications* (Section d'applications industrielles) which studies all problems of wood utilization; impregnation, drying and preservative treatment; glues and varnishes; machining of wood; testing of structural units and individual members, etc. The Laboratory conducts general research and also performs tests at the request of private industry.

Finally, a *Reference Center* (Centre de documentation) has recently been established by the Institute and is at the disposal of all wood users. This Center has a large technical library and an extensive collection of reference material, both French and foreign. Inquiries are handled by personal consultation or by mail. It is now being equipped to supply upon request microfilms and photostatic copies of documents and pamphlets, etc.

Organization of the Central Timber Testing Laboratory (Laboratoire central d'essais des bois)

This laboratory is organized into the three following sections, each suitably equipped and specializing in a specific program of research:

1) *Biological and Technological Section* (Section de biologie et technologie).—The studies carried out here are, of course, the basis of all research on wood since they are concerned with the structure, properties, and compositional defects and variations of wood. Studies in wood anatomy permit the identification of different woods, so important from a commercial point of view, and the investigation of the different elements with a view to their industrial utilization (cellulose, chemical industry, etc.). Technology permits determination of defects, selection of the best varieties, listing of specifications, and determination of the essentials for different end uses. It also involves research on the characteristics of wood enemies such as insects and fungi and on the efficiency of products used for protecting wood from their action.

For these studies the section possesses a micrographic laboratory containing research microscopes, a polarizing microscope, binoculars, and various measuring instruments. For research on durability and on the value of antiseptic products and the measurement of their toxicity, it has a mycological laboratory equipped with incubators, autoclaves, and other special equipment used in this kind of research.

2) *Physical and Mechanical Section* (Section de physique et mécanique).

This branch carries out: (a) Fundamental research in which wood is considered from the point of view of the physicist simply as a material under scientific investigation, without consideration of immediate practical application. These tests are to determine the elastic properties of wood, its physical and mechanical characteristics, and the influence of certain factors, such as structure, on the physical and mechanical characteristics of each variety. (b) Practical tests from the point of view of the engineer in which problems relating to the strength of materials, as such, are investigated. The determination of safe loads, the influence of defects, and the strength of assemblies are a few of the important problems considered in this connection.

The section is well equipped. The mechanical testing room contains a screw-type Trayvou horizontal testing machine with a capacity of 50 metric tons. This is a very large machine especially constructed for wood testing. It permits bending tests up to a span of 2 meters and buckling tests on pieces up to 6 meters in length. It has variable speed and three loading ranges. It permits testing of full-size pieces such as built-up beams, columns, girders, etc., as well as small specimens or scale models. The laboratory also has a Malicet and Blin universal machine of 12 metric ton capacity, a special Amsler hand-powered machine for standard tests of wood; a torsion machine with chart-type recorder; a Monnin-type machine for tests of wood quality on standardized test pieces; a dynamometric ram of 10 kg./m capacity S.T.A.; a rotary ram for shock tests at various speeds; various dynamometers, balances, measuring apparatus, etc.

Research on wood seasoning is also conducted by this section. The prime necessity of producing seasoned wood is generally recognized and, owing to the economic difficulties attendant on natural drying, artificial drying has become of increasing importance. There is a whole field of physico-chemical research on humidity, absorption and retention of moisture by the cell walls, etc., which is as yet only in its elementary stages. The practical value of this research is that it will lead to a knowledge of the conditions of the passage of water through wood and of seasoning. It will thus be possible to establish seasoning tables and precise rules for use in industrial seasoning practices.

Studies of the main elements of seasoning are carried out in a group of kilns and compartments that permit all kinds of tests, ranging from small-scale laboratory tests up to semi-industrial practical tests. Special kilns provided with uniform longitudinal circulation and moisture injection make it possible to determine the characteristics of sample specimens. Dry kilns of semi-industrial size, equipped with automatic balances and special regulating devices, make it possible to interpret the results obtained in terms of industrial operations and thus to reach conclusions which are valid for dry kilns of larger dimension.

3) *Chemical Section* (Section de chimie).—In view of the importance of wood in the modern chemical industry and its adaptation to all kinds of uses, the program of this section is very extensive.

The laboratory acts as a liaison agent between the different specialized French laboratories. It comprises a general chemical laboratory for analysis, research on wood constituents, quantitative analysis, determination of chemical properties, extraction of component elements, etc.

Attached to this laboratory is an impregnation room, equipped with an experimental autoclave three meters in length with an upper autoclave for impregnation by the Rüping process and two smaller autoclaves for special impregnations (antiseptics, synthetic resins, etc.). This equipment naturally includes a steam boiler, a compressor unit, and liquid storage vats, as well as the customary measuring instruments such as thermometers, manometers, vacuum gauges, etc. An idea of the possibilities of the installation may be had from the fact that it permits the use of temperatures up to 180° C. in the autoclaves (steam-heated by external jacketing) and pressures up to 35 kilograms per square centimeter.

Basic Research and Industrial Application

Most of the investigation and research is conducted both on the theoretical level, to improve the general knowledge of wood, and on the practical level with regard to its application to construction and industry. The Laboratory is therefore divided into two main sections, one concerned primarily with basic research, the other with industrial applications; but the line of demarcation between these two types of research is not always clearly defined and the two fields very often overlap.

In addition to its research of a general nature, the Laboratory undertakes studies, tests, and analyses on behalf of individuals or various organizations. A nominal fee covering only the time of the technicians and workers and the costs of materials is charged. All requests for information are answered, either by the Laboratory or by the Reference Center.

The Laboratory is thus in direct contact or in constant correspondence with numerous manufacturers or users of wood, as well as with numerous government or private agencies. Among these may be mentioned the Ministry of Reconstruction and City Planning (Ministère de la Reconstruction et de l'Urbanisme) for technical consultation on documents and specifications; the Postal and Telegraphic Service (Administration des Postes et Télégraphes), the National Electric Power Administration (Electricité de France), the National Railway Company (Société nationale des chemins de fer) for all matters concerning wood impregnation and preservation; the Ministry of Air and of the Navy, and the Renault Administration (Régie Renault) for matters pertaining to the use of wood in construction; and the Paper Industry Technical Association (Association technique papetière) for those pertaining to the use of wood in paper manufacture, etc. Often special studies have been carried out for these organizations.

To give some idea of the number of these consultations and tests and the extent of the Laboratory's service to other agencies, a few figures will be cited.

Identifying wood specimens at the Central Timber Testing Laboratory.

During 1948, the Laboratory handled more than 1,000 incoming letters and more than 1,300 outgoing. Detailed replies were made to more than 350 requests for information on a great variety of subjects concerning the properties of wood and its industrial utilization. Approximately 150 paid tests were made for a total of over 360,000 francs. The number of callers in search of information and advice during the same period amounted to more than 500. These figures show the great number of services performed, in spite of a reduction in personnel and the fact that the staff was occupied primarily with the general research functions of the Laboratory.

Several methods are employed to make available the results obtained in the Laboratory. Reports have been made on all studies as soon as they produced results. These may be consulted under the appropriate heading in the Reference Center, which is open to the public. Numerous articles have been published in the documentary and technical section of *La Revue du Bois* (The Wood Review), sponsored by the National Timber Institute, and in professional journals or technical reviews. Special bulletins on the use of wood in construction have been published through the *Annales de l'Institut technique du bâtiment et des travaux publics* (Annals of the Technical Institute of Building and Public Works).

Finally, pamphlets have been published directly by the Laboratory and sold at a price sufficient to cover the cost of printing. An edition of 4,000 copies of a manual on saw filing was sold out within a few months of publication. Seven hundred copies of pamphlets put out by the Laboratory were sold during the year 1948.

Other Organizations

Colonial Wood Laboratory — Technical Section for Forestry of the Ministry of Overseas France. (Laboratoire des bois coloniaux — Section technique forestière du Ministère de la France d'Outre-Mer)

The Technical Section for Forestry of the Ministry of Overseas France is an administrative research organization attached, from the technical point of view,

to the Service of Waters and Forests of the Ministry of Overseas France (Service des eaux et forêts du Ministère de la France d'Outre-Mer, 27, rue Oudinot, Paris) and, from the administrative point of view, to the Technical Section for Tropical Agriculture (Section technique d'agriculture tropicale, 45 bis, avenue de la Belle Gabrielle, Nogent-sur-Marne).

The tropical forests, which constitute the world's last untapped source of wood, contain a very large number of species whose properties are as yet unknown. The Technical Section for Forestry is concerned with the study of the wood of these species with a view to determining the possibilities and methods of their use. It at present includes: (1) an administrative organization, comprised of a section chief and a secretarial staff; (2) a library (for the time being not open to the public) and a museum of colonial woods (which may be visited by the public), and (3) three research divisions, the Divisions of Technology, Anatomy, and Chemistry.

The Division of Technology includes: (a) A laboratory for physical and mechanical tests of wood in which the physical and mechanical properties of tropical woods are studied and determined; (b) a sawmill and a wood-working shop in which systematic tests are made to determine the tool or machine appropriate for each wood and the best methods of using such equipment.

The Division of Anatomy laboratory is devoted to the examination of woods with a view to determining, on the one hand, positive methods of identifying various species from samples and, on the other hand, the relationships that may exist between the structure of different woods and their possible uses. The principal activities of this laboratory are: (a) Obtaining specimens of native growth, some with herbarium material so that a positive botanical identification can be made; examination of wood with the naked eye and by means of the magnifying glass and the microscope; and systematic description of sections and photomicrographs and preparation of identification keys; (b) comparative studies of the structural characteristics of various woods in relation to their mechanical and physico-chemical properties.

The Division of Chemistry studies: (1) In a general way the relations which can exist between the chemical composition of woods and their possible uses; (2) special methods of wood treatment involving the study of wood as a chemical raw material in order to derive from wood the wide range of extremely varied products which it can provide. Research is also conducted on the secondary components of wood and its by-products, such as tannins, substances extractible with neutral solvents, gums, resins, etc. Among the various methods of treatment, dry distillation and wood hydrolysis are the subject of special investigation.

The Pine Institute Laboratory (Laboratoire de l'Institut du pin)

The laboratories of the Pine Institute, housed in the Science School of the University of Bordeaux (Faculté des Sciences de Bordeaux), focus their attention upon problems relating to Maritime pine (*Pinus pinaster*) and especially upon improvements and investigations necessary to the pine resin industry in the forests of southwestern France.

In addition to its administrative section, the Pine Institute includes the following laboratories and services:

1) *Research laboratories on the chemistry and use of resinous products and their derivatives.*—This service, which is the largest, has a staff of eighteen persons, including the laboratory head and eight chemical engineers. Various studies on resins of both a theoretical and a practical nature are now under way. In particular, much attention is being turned to the question of the incorporation of resinous products in copolymers, so that these may benefit from the enormous and extremely rapid development of synthetic resins and plastics, a development which would endanger the resinous products industry unless proper steps were taken to participate in this field. Mention might also be made of tests on a semi-industrial scale of the hydrogenation of rosins, the preparation of dextropimaric acid, etc.

2) *Physical Research Laboratory.*—This laboratory possesses the necessary apparatus for polarimetric measurements, observation by means of Raman, ultraviolet and infra-red spectrography, X-ray photography, etc., which are indispensable for research on the composition and utilization of the products studied in this Institute.

3) *Laboratory of Forest Biology.*—This laboratory studies the diverse problems relating to the forests of the Landes region: propagation of Maritime pine by cuttings, seed germination, destruction of undergrowth with chemical agents, etc. It also subsidizes research on insect enemies of the Maritime pine, particularly on the bark beetle, which is the cause of great damage in the forest.

4) *Reference Center.*—This service maintains a large technical library, with French and foreign reference material, specializing in the subject of resinous products.

Laboratory of the French School of Papermaking at Grenoble (Laboratoire de l'École française de papeterie de Grenoble)

The Paper Laboratory at Grenoble (Isère), located in the French School of Papermaking, is concerned with studies, research, and experiments to further the development of the pulp, paper, and paperboard industries and to improve manufacturing processes. It comprises:

An experimental papermaking plant.—This is installed in a large room equipped with a papermaking machine having an effective width of one meter, a rotating spherical digester rated at 6 kilos, a combination beater and bleacher, a beater, a calender, and a trimmer. The auxiliary services (motive power, electric boiler, etc.) are housed in the basement. With this equipment it is possible to run semi-industrial tests on the utilization of raw materials, and research is conducted with a view to adaptation of laboratory results for use in industry.

A laboratory for physical, chemical, and micrographic tests on pulp, paper, and paperboard.—A number of rooms are assigned to this service; they are

provided with entirely new equipment, quite distinct from that used in instruction.

The physical testing laboratory consists of a constant-temperature chamber conditioned to 21° C. and 65 percent relative humidity by means of an automatically controlled machine comprising a cold-air intake, a ventilator, a heater, a water-spray cabinet and a refrigerating machine.

There is a darkroom for micrographic photography for studying the effects of aging paper by the Wood light method and for observation of colorfastness.

The laboratory for chemical analysis is in a spacious room, completely equipped for day-to-day problems of analysis. It is supplemented by two additional rooms in which long-range and detailed research is carried on.

The micrographic laboratory occupies extensive quarters on the fourth floor; it is thus assured the strong light which is essential for microscopic examination. The laboratory possesses a considerable collection of raw materials, pulps, papers, paperboards, prepared microscopic slides, photographs, and drawings to facilitate identification of the different types of paper fibers.

A laboratory for the manufacture and testing of paper and pulp.—The equipment consists of small beaters of various types, equipment for the preparation of bleaching solutions such as calcium hypochlorite and sodium hypochlorite, and a small machine for making round test sheets.

For the preparation of paper pulps, this laboratory has two digesters built of acid-resistant steel, heated by induction, and rated at 15 kilos, with which it is possible to conduct experiments on all processes of cooking raw materials under pressure using calcium bisulfite, soda, sulfate, monosulfite, etc., with a charge of from 100 grams to 1 kg. 500 grams of raw materials; a laboratory-type disintegrator for fiberizing and separating the material after cooking; and a bleaching apparatus.

For pulp testing, the equipment consists of a Lampen mill, a Schopper-Riegler apparatus, a disintegrator, a sheet former, a hydraulic press, and drying rolls. With this equipment it is possible to reproduce very precisely the stages of pulping for the purpose of studying the effect of various factors on the strength of the pulp.

Equipment for the preparation of standard sheets is also employed for research on sizing, coloring, etc.

Reference Bureau.—This bureau was set up at the request of manufacturers, who wished to have a complete reference center for use by their industry attached to the School. It consists of a collection of the principal works on papermaking and especially files of technical journals.

The Paper Laboratory makes studies of all vegetable fibers, particularly domestic woods, with a view to their better utilization in papermaking. A particularly broad program of research is being carried on at present in conjunction with the Laboratories of the National Chemical Services (Laboratoires des services chimiques de l'Etat) for improved utilization of coppice woods, such as beech, elm, poplar, basswood, and birch.

Central Laboratory of the National Chemical Services (Laboratoire central des services chimiques de l'Etat)

This is the only organization for research, study, and supervision under the Directorate of Chemical Industries (Direction des industries chimiques) of the Department of Commerce and Industry (Ministère du Commerce et de l'Industrie). It has two estab-

Logs of tropical species are tested at the Colonial Wood Laboratory.

lishments, presided over by one director: (1) the main laboratory in Paris, and (2) an annex at Bouchet-par-Vert-le-Petit (Seine-et-Oise). Its general research activity is mainly devoted to the study of the large molecules (cellulose, rubber, etc.) and to related problems.

In addition to the resources provided by the establishment's laboratory of pure science, which places at its disposal such ultra-modern apparatus as the electronic microscope, spectrographs, furnaces for micro-analysis, the ultra-centrifuge, osmometers, etc., which it may find occasionally useful, the Cellulose Technical Branch of the Central Laboratory possesses the following equipment of its own at Paris and at Bouchet: all the chemical equipment needed for ordinary analyses and preparations; microscopic and micrographic equipment; viscosimetric equipment; an air-conditioned room (temperature 20° C., relative humidity 65 percent), capable of accommodating four working personnel and apparatus for measuring paper characteristics; the necessary equipment for pulp-cooking (digesters and autoclaves); standardized English equipment for "picking" the sheets and checking mechanical properties.

Monthly meetings of the "Cellulose Commission," composed of representatives from various governments or private laboratories and organizations, are held in this laboratory. The Commission, subdivided into technical subcommittees on pulp analysis, wood analysis, beating, etc., serves to co-ordinate the activities and projects of the various participating bodies in the direction of topics of general interest which are proposed either by members of the Commission or by manufacturers in the paper and artificial textile industries.

At present, the main lines of wood research are the following:

1) In conjunction with the Cellulose Commission, laying down approved methods of analyzing various woods and cellulose pulps in line with the proposal to AFNOR (Association française de Normalisation) for standardizing operating techniques as, for instance, calculating the proportions of alpha cellulose, lignon, pentosans, ash, extract of organic solvents; determining index figures for copper and iodine; measuring the nitro-acetonic concentration; estimating the amounts of polysaccharides readily obtainable by hydrolysis from wood; determining microscopically the fibrous composition, the effect of methods of division used in the preparation of samples, etc.

2) *Measurement of paper characteristics.*—Research on the improvement of more or less standardized apparatus now used for testing paper pulps. Checking of paper pulps submitted for approval. Expert appraisal of pulps, papers, and paperboards upon the request of manufacturers.

3) *Chemical studies on wood sugars.*—Research and perfecting of methods of characterization, extraction, and analysis of glucosides and saccharides contained in vegetable substances.

4) *Theoretical and practical study of the beating of cellulose pulps.*—The influence of various physical and chemical factors on the speed and efficacy of different types of beating equipment. Investigation to determine a satisfactory theoretical explanation of the beating phenomenon. Accelerating agents. The effect of beating on the mechanical, physical, and chemical properties of the fibers treated.

5) *Research on the manufacture of cellulose pulps.*—(*a*) *Paper pulps.* An extensive research program has just been undertaken, in collaboration with the laboratories of the School of Papermaking at Grenoble and the laboratory of the National Wood Institute, for the study of the use of wood of broadleaved trees in papermaking: a study of the various chemical and semichemical processings of various species of coppice woods, beech, elm, basswood, and birch. In addition, a comparative study of the different processes of preparing pulp from straw is now under way. Finally, studies of a general nature on the various reactions that occur during cooking will be given consideration in the very near future. (*b*) *Pulps for artificial textiles.* Perfection of the preparation of pulps for viscose, derived from annuals of the vegetable class such as wheat straw and alfalfa and from deciduous trees (beech, poplar, etc.).

Co-ordination of Research

Liaisons exist between these various organizations and those of the General Directorate of Waters and Forests (Direction générale des Eaux et Forêts), and in some cases the latter subsidizes research of general interest (papermaking, hydrolysis, utilization of broadleaved trees, etc.) from funds which it has available for research purposes. In such cases, the Directorate participates in working out the programs and follows the development of subsequent operations. Actually, the wood resources of France are the responsibility of the Ministry of Agriculture; thus all questions concerning the use of wood and the technical development of its possibilities of utilization are of the utmost concern to the Ministry.

Photographs accompanying this article supplied by courtesy of the authors.

Commodity Reports

Wood Pulp

The figures quoted in the text are those available up to 1 March 1950, drawn from official sources, from World Wood Pulp Data (*published by the Canadian Pulp and Paper Association and the United States Pulp Producers Association*), *and from trade journals. Except where otherwise indicated, metric units are used throughout.*

IN 1948 wood pulp consumption in North America attained new record heights, and consumption by European mills, although still below normal levels, was rapidly increasing. Toward the end of the year, however, a leveling-off of demand in the United States developed into a recession on the world export market, which reached a climax by midsummer of 1949. For the Northern European exporting countries, greatly dependent on pulp exports as a source of dollar exchange, this situation was the more serious when viewed in the light of substantial increases in North American productive capacity.

However, in early September 1949 a renewal of activity became apparent in the U.S. pulp market, and by the turn of the year the United States was back to record-breaking monthly production and consumption. There was also a partial recovery of the earlier drop in Northern European exports to the United States and other destinations. Over-all production for 1949 in North America was lower than for 1948; but the revival in the last months of 1949 promises a possibly higher consumption level in 1950, although the record 1948 figures will probably not be reached. Such a situation in North America should help maintain a firm world pulp market.

Northern European exporters have continued their efforts to sell on the U.S. market. So far, devaluation of currencies has not given rise to underbidding, but it is too early to say how the situation may develop. On the other hand, devaluation has given relief to Northern European producers with relatively high production costs. The trend in the United States is still toward dependence on North American supplies; Europe has maintained its position as the major source of supplies for all continents except North America.

Statistics assembled by the Montreal Pulp Conference organized by FAO in May 1949 indicated that the 1948 output was slightly in excess of current consumption. Although the apparent world surplus was less than 3 percent of production and may have been due to statistical inaccuracies, it did tend to explain the decline in prices, the accumulated stocks, and of their pulp. The estimates for 1949 and 1950 indicated a rapid restoration of equilibrium, which appears now to be the actual situation.

World production and trade data for 1949 are summarized in Table 1.

TABLE 1.—WOOD PULP: WORLD PRODUCTION AND TRADE DATA

Region	1949 Estimates			
	Production	Imports	Exports	Consumption
	1,000 metric tons			
TOTAL	26,822	4,654	4,864	26,612
North America	17,888	1,793	1,516	18,165
Latin America	219	209	—	428
Europe	8,086	2,550	3,348	7,288
Northern	5,356	13	3,247	2,122
Eastern	421	66	—	487
Western	672	1,968	4	2,636
Central	1,637	503	97	2,043
South Africa	15	1	—	16
Asia and Pacific	614	101	—	715

— None.

WOOD PULP PRODUCTION

World pulp production in 1949 (excluding the U.S.S.R.) is estimated at about 27 million tons. This is less than the 1948 output, and less than the volume of production that had been considered possible by the Montreal Pulp Conference in May 1949.

In most European countries steady rehabilitation of the pulp industry continued through 1949, the largest production increase (about 70 percent) having occurred in Western Germany. A few European countries still operate far below capacity, primarily because of pulpwood shortages. But Northern European mills, which had cut production during the first half of 1949, were later reported running close to capacity.

World pulp-producing capacity continues to expand. In North America over 2 million tons of new capacity have come or will soon come into operation. In Europe, Portugal and Norway are planning to erect new mills, and there are also plans for increased capacity in Austria, Czechoslovakia, and Yugoslavia. In Australia and New Zealand new developments are under way, and new pulp mills are projected in Asia and the Far East. At the same time, recent estimates

still place the idle pulp capacity of the world at over 5 million tons. Most of this idle capacity is located in Europe, North America, and Japan.

The 1948 and 1949 production figures for North America and Europe are shown, by countries, in Table 2, together with figures on production capacity.

North America

North American production of all grades of pulp in 1949 totaled approximately 17,900,000 tons, about 950,000 tons less than in 1948.

United States of America

In 1948 wood pulp production in the United States reached an all-time record of nearly 11.7 million tons. In late 1948, however, paper and paperboard production started to decline, following the general economic trend, and this decline was accompanied by a drop in consumption of wood pulp, particularly of market pulp. During the following months, consumers of market pulp drew heavily on inventories that had been acquired in many instances at prices much higher than those currently prevailing.

In 1949 the manufacture of paper and paperboard, at 18.4 million tons, was approximately 1.4 million tons below the 1948 record, and rayon production dropped 12 percent. Total U.S. wood pulp production (11.0 million tons) fell below the 1948 volume by about 6 percent. In August 1949, however, as a result of the general economic situation, confidence began to return throughout the pulp industry, and during the last three months of the year greater tonnages of wood pulp were produced and consumed than in any previous corresponding period.

The brisk demand for pulp continued in January 1950, and it is generally expected that mill requirements will be sustained at high levels, at least during the first part of the year. Inventories, which had dropped to a lower level than at any time since May 1947, are now in process of replenishment.

Canada

In 1948, Canadian (including Newfoundland) mills, operating at capacity, produced nearly 7.2 million tons of all grades of wood pulp (360,000 tons more than in 1947, and almost double the volume of 1937). The decline in U.S. demand during 1949 affected Canadian output of market pulp; and although the final figures for 1949 are not yet available, production and sales are expected to be slightly below the 1948 figures.

The increasing demand for kraft pulp has led to the construction of three new sulphate pulp mills having a total projected capacity of 145,000 tons annually, to add to the existing Canadian capacity of some 700,000 tons a year; they will come into operation progressively over the next two years.

Europe

European pulp production for 1949 is estimated at approximately 8.1 million tons, compared with 7.9 million tons in 1948.

In most European countries rehabilitation and modernization of plants have made further progress, while supplies of raw materials and equipment and availability of manpower have definitely improved as compared with the immediate postwar years. Many formerly idle mills are getting back into production.

Table 2.—Wood Pulp Production and Consumption, North America and Europe

Country	1948			1949 (Estimates)		
	Capacity	Production	Consumption or new supply	Capacity	Production	New supply
	1,000 metric tons					
North America	19,254	18,839	19,036	20,686	17,888	18,165
Canada[1]	7,397	7,161	5,470	7,900	6,863	5,492
United States	11,857	11,678	13,566	12,786	11,025	12,673
Europe	10,881	7,905	6,958	10,924	8,086	7,288
Northern	7,376	5,467	2,439	7,352	5,356	2,122
Finland	2,482	1,675	817	2,485	1,550	652
Norway	1,324	823	506	1,324	935	493
Sweden	3,570	2,969	1,116	3,543	2,871	977
Eastern	443	392	474	483	421	487
Hungary	25	6	41	25	6	40
Poland	231	210	255	256	227	250
Romania	148	140	138	157	145	145
Yugoslavia	39	36	40	45	43	52
Western	977	674	2,395	1,004	672	2,636
Belgium	77	52	212	77	66	183
Denmark	5	1	76	5	1	74
France	545	459	771	562	467	830
Ireland	—	—	10	—	—	13
Netherlands	110	39	193	120	41	41
Spain	82	59	100	82	46	103
United Kingdom	158	64	1,033	158	51	1,392
Central	2,085	1,372	1,650	2,085	1,637	2,043
Austria	385	258	243	385	284	244
Czechoslovakia	419	304	281	419	326	286
Italy	240	203	300	240	215	423
Western Germany	890	471	619	890	676	895
Switzerland	151	136	207	151	136	195

— None or negligible.
[1]Includes Newfoundland.

Northern Europe

Finland. Since the end of the war, Finland has made remarkable progress in restoring the productivity of its mills and improving supplies of raw materials for the pulp industry. Manpower too has been more readily available. In 1948 production of pulp amounted to about 1.7 million tons, approximately 60 percent of total capacity. A leveling-off of exports and production late in 1948 seriously threatened the country's economy. By the spring of 1949 stocks of pulp were more than double the normal, and several manufacturers were compelled to reduce output.

In the fall of 1949, the partial recovery on the U.S. and world markets brought renewed stimulus to Finnish pulp production, and at the end of the year the pulp industry was operating at near capacity. But although the final figures for 1949 are not available at the time of writing, production is expected to have been less than 1.6 million tons. Stocks of chemical market pulp had decreased approximately 50 percent from the levels prevailing in the spring.

Sweden. In 1948 Sweden's production of all grades of pulp amounted to approximately 3 million tons. Production in early 1949 was limited, mainly because of inability to obtain pulpwood. There are, in fact, supplies of pulpwood in southern and central Sweden, but current price levels do not permit the shipping of these supplies to northern Sweden. Germany is reported to have negotiated for pulpwood imports at prices almost twice as high as those paid by Swedish mills.

As was the case with Finland, brisker activity in the fall of 1949 in some degree made up the earlier lag. According to preliminary estimates, the 1949 production of market pulp (including viscose pulp) was over 1.70 million tons, or almost as much as in 1948, when it was just over 1.75 million tons. In this connection it may be recalled that the corresponding figure for the record year 1937 was 2.25 million tons.

Norway. Norwegian production in 1949 is expected to show a slight improvement over the 1948 levels. Confidence in future possibilities is evidenced by the fact that Norway plans to build a new chemical pulp mill with an annual capacity of 90,000 tons.

Central Europe

Austria. Gradual improvement in Austria's pulp output continued through 1949, and the year's production of all grades of pulp is estimated at 284,000 tons as compared with 258,000 tons in 1948. Production capacity, which is approximately 385,000 tons, could be expanded by modernizing mill equipment, and the present limited supplies of domestic raw material could be increased by carrying out thinnings to provide more pulpwood and by making greater use of sawmill "waste."

Czechoslovakia. As in Austria, pulp output in Czechoslovakia showed gradual improvement in 1949, and production of chemical pulp for the year is estimated at about 325,000 tons, approximately 25,000 tons over the 1948 figure. Production of chemical pulp from hardwoods is now being undertaken by a new mill in the eastern part of the country.

Italy. The chemical pulp industry in Italy is now running close to capacity in an effort to speed the export drive for paper and paperboard. Domestic production of pulp, however, provides barely 30 percent of the paper industry's requirements; the remainder has to be imported. An important event for the Italian paper industry was the granting by ECA of a $1,650,000 loan for the import of American paper-manufacturing machines.

Western Germany. The largest production increase in Central Europe occurred in Western Germany, where output increased from 471,000 tons in 1948 to an estimated 676,000 tons in 1949, a figure equal to 75 percent of existing capacity. This rapid gain was stimulated by Marshall Plan aid and by the cutting-down of pulpwood exports from the French Zone. Towards the end of 1949, pulpwood imports from Sweden to Western Germany were resumed for the first time since the end of the war. Bizone industries contracted for 350,000 cubic meters of Swedish pulpwood, subject to the approval of trade licenses. The price of pulpwood, most of which is obtained from state forests, is much higher in Western Germany than in other countries. As long as this situation remains unchanged, pulpwood imports are likely to be continued.

Eastern Europe

Production figures for Eastern European pulp-producing countries are estimates. For 1949 the combined production of *Hungary, Poland, Romania,* and *Yugoslavia* has been set at about 420,000 tons, as compared with 390,000 tons in 1948.

Western Europe

Pulp production in 1949 for Western European countries appears to be about the same as in the previous year. The *Netherlands* and the *United Kingdom* are said to be still operating at approximately 30 to 40 percent of capacity. In *Portugal,* according to recent reports, complete plans for an integrated mill, capable of producing initially 20,000 tons of sulphite pulp and 18,000 tons of paper a year, have been drawn up. The pulp capacity may later be doubled and the paper capacity increased to 28,000 tons. Ultimately this mill, in conjunction with a sulphite mill producing 6,000 tons annually, may be able to supply Portugal's entire requirements and leave a portion of its output for export. The new mill will be located in a heavily forested region which can furnish it with sustained pulpwood supplies. Construction is expected to begin shortly, and the mill may start operations toward the end of 1951.

LATIN AMERICA

Despite some expansion in recent years, pulp production in Latin America still covers only approximately one-third of the region's requirements. Further developments depend largely on the possibilities of using indigenous species, including hardwoods, for the production of pulp at competitive costs.

Recent experiments with tropical and other hardwood species have been carried out in a number of countries. A significant technical advance has been the perfection of the neutral semi-chemical process, which involves both a chemical softening and a mechanical grinding. In experiments conducted on an industrial basis, as many as 30 different species have

been pulped simultaneously with success. This is an important development in view of the virtual impossibility of segregating at reasonable cost many of the hardwood species, which grow in dense mixed stands. The pulping of tropical woods will probably receive a great impetus during the next two decades. If so, Latin-American pulp production may grow further and make possible an increase in the relatively low level of pulp consumption.

Argentina

At the rate of production prevailing during the first 10 months of 1949, Argentina's production of chemical pulp (including pulp not made from wood) for the whole of 1949 is not expected by the trade to differ materially from 1948 levels, when 25,000 tons of chemical pulp and 12,000 tons of mechanical pulp were produced. Recent studies indicate that, with improvement in transportation, enough pulpwood to double present pulp output could be supplied from the Paraná Delta region. This is important, as straw, reeds, cane, and bagasse, which form an important source of raw material, are now harder to obtain than in the past. New wheat-harvesting machines leave the straw bent or scattered and make its collection more difficult, while cane sugar mills have installed machinery for the use of bagasse as a fuel, since the supply of fuel oil has been uncertain.

Chile

A new sulphate wood pulp plant is projected between the Provinces of Nuble and Concepción in Chile. The capital is being provided by the Chilean Development Corporation and by Compañía Manufacturera de Papeles y Cartones.

Peru

A small pulp and paper mill is under construction near Chiclogo. Capacity is said to be 3,000 tons per year, the raw material being bagasse. There is a second project for a new pulp and paper plant, and a concession has been obtained from the Peruvian Government covering the import duties and certain other taxes for the required machinery, which has been valued at approximately $1,180,000. The Peruvian Amazon Corporation is also said to be investigating the establishment of a pulp mill in eastern Peru.

Uruguay

A new pulp and paper mill has been placed in operation in Uruguay, the raw material used being straw.

OCEANIA

Australia

According to recent reports, Australia's pulp and paper producing capacity is undergoing further expansion. One pulp mill is being expanded from a capacity of 36,000 tons per year to 61,000; at the same time, its capacity for producing bleached pulp is being extended. Four new machines constitute the main features of the first stage of the development program. When these are all in production, the total annual output of paper and paperboard is expected to exceed 180,000 tons.

Plans for the construction of a new mill in Queensland are also reported to be proceeding satisfactorily. The first machine to be installed will produce 13,500 tons of cardboard annually.

New Zealand

Construction has recently begun on New Zealand's first wood pulp mill, and over $500,000 worth of equipment has been ordered. This mill is scheduled to begin production at the end of 1951 with an initial output of 23,000 tons yearly. It will be the key unit in a development planned to have other wood utilization units closely integrated with it. These units will be a kraft paper mill with an annual output of 10,000 tons and a modern Swedish gang-saw mill with a yearly capacity of 33,000 m^3.

Another mill which eventually will have a much greater output is planned by the government, to be located on the east coast of the North Island. Present proposals are for an annual production of 51,000 tons of newsprint, 9,000 tons of printing papers, and 24,600 tons of unbleached pulp for export. The whole installation will include a groundwood mill with an initial pulping capacity of 150 tons a day, a sulphate pulp mill of similar capacity, a bleaching plant, and a sawmill with an annual capacity of 160,000 m^3.

SOUTH AND EAST ASIA

Japan

Japan's production of all grades of pulp rose from slightly less than 300,000 tons in 1947 to 410,000 tons in 1948, and preliminary figures for 1949 show another increase to approximately one-half million tons. While mechanical pulp mills are running to capacity, present output of chemical pulp amounts to only about 54 percent of 1941 production. The rayon pulp mills have an installed capacity sufficient to produce 180,000 tons per year; their production of 33,000 tons in 1948 and around 54,000 tons in 1949 indicates the present low rate of operation.

The major problem in Japan is inadequate pulpwood supplies. Although imports are anticipated, reforestation is said to be the fundamental long-range solution to the Japanese forest problem. Additional raw material is available in the form of rice, wheat, and barley straws. Over 16 million tons of these straws were available from the 1948 crops; and it has been said that nearly four times the present paper needs of Japan could be produced from such products.

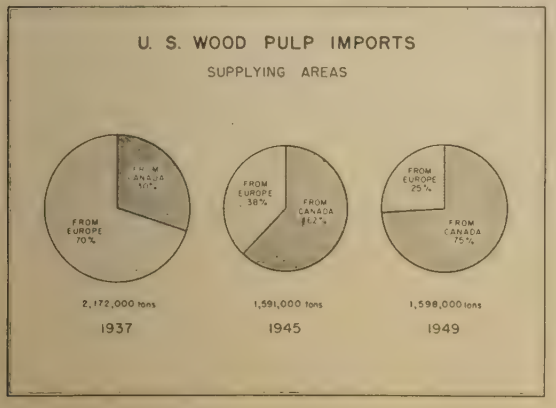
Philippines

Establishment of a pulp mill to supply an existing paper mill was approved in October of last year. It is reported that US$600,000 will be made available from the national economic development fund to support this project. The mill is expected to conserve dollar exchange which otherwise would be required for obtaining foreign pulp.

Wood Pulp Trade

Despite the recovery toward the end of the year, Northern European pulp exports to the United States in 1949 fell 22 percent below the 1948 volume, and Canadian exports about 19 percent. The drop in Canadian exports of market pulp amounted to 27 percent.

The chart below illustrates the marked changes in the pulp supply sources for the United States market which have occurred over a period of thirteen years, and the trend toward increasing dependence on North American sources of supply. The prewar dominance of European suppliers was halted by wartime conditions, and is not likely to revive. In 1945, 62 percent of U.S. imports came from Canada, while the remaining 38 percent originated exclusively from Sweden. By 1949, pulp supplies from all European sources had dropped to 25 percent.



The consequences of the currency devaluations of 1949 are not all clear. The revived interest of American buyers in European pulp was due more to the upswing in business conditions in the U.S. paper industry than to devaluation. European sellers maintained more or less the same dollar prices after the devaluation as before, and the depreciation of the Canadian dollar did not cause any reduction in Canadian pulp prices. Devaluation helped European exporters cover their relatively high production costs, and sales to the United States became temporarily more profitable than to other nations, whereas before devaluation the contrary was the case. The difference in price levels has, however, since narrowed as a result of price rises on the European markets.

North America

United States

In 1948 U.S. imports of market pulp dropped below the 1947 volume by about 400,000 tons. This downward trend continued through October 1949, when imports showed a marked rise, achieving the highest monthly total since August 1948.

Total pulp imports for 1949 amounted to 1,598,000 tons, one-fifth less than in 1948. The largest declines were registered for Swedish and Finnish pulp (30 percent and 20 percent respectively), while imports from Canada dropped by 18 percent. Shipments from Norway, though quantitatively small, were over 150 percent greater than in 1948.

The types of imports reflected continued demand for the bleached categories. While imports of unbleached grades dropped 40 percent between 1948 and 1949, the bleached sulphite imports for the two periods were at the same level, and bleached kraft even achieved a gain of 40 percent.

Offers of small quantities of unbleached chemical pulps from the U.S.S.R., as well as trial offers of both bleached and unbleached pulps by Czechoslovakian and Austrian producers, have been reported. Imports from Austria in 1948 were small; in 1949 they amounted to 3,000 tons and imports from Czechoslovakia to 1,000 tons.

In certain segments of the U.S. industry, concern is still felt about possible further effects of the devaluations and about the tariff reductions on certain pulp products negotiated at Annecy, ranging up to 50 percent on some items.

Canada

During 1948 Canada's pulp exports to the United States increased by about 6 percent over the 1947 volume and were nearly three times the prewar average. Its shipments to the United Kingdom rose by about 39 percent over 1947.

In 1949 pulp exports to the United States were approximately 1,400,000 tons, about 230,000 tons less than in 1948. Their dollar value was about 15 percent below the 1948 level (approximately US$177 million, compared with US$211 million in 1948).

The decline in shipments to the United States in 1949 coincided with a reduction in exports of wood pulp to overseas destinations. Import restrictions and currency troubles are factors responsible for this reduction. Commonwealth countries have been the traditional markets, but they cannot afford the dollars. Canadian producers are eager to retain as much as possible of these markets, because a single market for pulp and paper products makes the Canadian manufacturer particularly vulnerable to fluctuations in the U.S. economy.

Europe

Exporting Countries

Finland. The reduction in prices and absorption capacity on world markets had a profound effect on Finland's pulp and paper exports. The economy of Finland is largely based on forest products industries: in 1948, for example, over 90 percent of Finland's total export receipts were derived from forest products; pulp and paper accounted for 51 percent.

During the seller's market of 1944 through 1947, the volume of exports expanded as rapidly as production capacity would permit. When a shift to a buyer's market occurred in the third quarter of 1948, rising production costs and an unfavorable exchange

rate prevented exporters from reducing prices. Exports leveled off late in 1948. Exports to the United States dwindled, aggravating the dollar shortage, and abnormally large stocks forced sizable production cutbacks.

Similar conditions prevailed in the paper and paperboard industry, where 12 percent of the paper machines had to be shut down. This situation caused the export industries of the country severe losses, and was a major element in the first decision to devalue the Finnish currency in July 1949.

In the late summer, however, the market began to show firmer tendencies, and by November Finland had not only made up for previous export losses but had exceeded corresponding 1948 totals. Total 1949 pulp exports were 920,500 tons, of which sulphite comprised 450,000 tons, sulphate 311,000 tons, and mechanical 160,000 tons. The United Kingdom was the largest buyer. Despite increasing sales outlets in the United Kingdom and elsewhere in Europe, Finland will probably continue efforts to recover a larger share of the U.S. pulp market. At the same time, more Finnish pulp is expected to be converted into paper and board for export.

Sweden. By the beginning of December 1949 the year's production of chemical and mechanical pulp was reported as sold. Total pulp exports for 1949 amounted to 1,894,000 tons, an increase of nearly 214,000 tons over 1948.

Stocks have been reduced considerably, and late in 1949 chemical pulp stocks were scarcely more than half of the 300,000-ton total that existed on 1 January 1949.

In the latter part of 1949 Sweden made great efforts to counterbalance the earlier export losses on the U.S. market. So far as is known now, its exports to the United States in 1949 will amount to about 320,000 tons, or roughly 17,000 tons more than in 1948. Some mills are now reported to be converting substantial tonnages of rayon pulp capacity to the manufacture of paper grades, primarily for the U.S. markets.

Under the new Swedish-British trade agreement, the United Kingdom is prepared to buy increased quantities of pulp and paper from Sweden in 1950, a development foreshadowed at the Montreal Pulp Conference. In comparison with the agreement for 1949, the quantities stipulated mean 25,000 tons more paper pulp, 30,000 tons more mechanical pulp, and 45,000 tons more paper and paperboard.

Norway. Pulp exporters in Norway have no doubt derived advantage from the abolition of three taxes on wood which the industry found particularly burdensome. The saving to the producer through these tax removals is appreciable; for instance, on bleached sulphite nearly $18.75 per ton. In addition, the government has offered to rebate 9 kroner per cubic meter of wood to all firms purchasing more than their original quotas. A plan has also been evolved by the government whereby firms shipping into hard currency countries may retain 10 percent of the dollar exchange to use for imports of capital equipment. A similar principle has been put into practice by Finnish authorities.

Norwegian pulp shipments in 1949 were approximately 36,000 tons greater than in 1948.

Austria. With the slow improvement in the general economic situation, paper supplies on the domestic market have become almost normal, and governmental controls have been abolished during the past year. The Austrian pulp and paper industry is now making great efforts to improve its export prospects in its traditional markets. Exports were restricted to 6,000 tons in 1946 and 9,000 tons in 1947; but in 1948 they went up to 39,000 tons, and they will probably stand at a slightly higher level in 1949. Prewar exports amounted to 175,000 tons. Italy is now Austria's most important customer. The United Kingdom, Switzerland, and Greece are further potential markets.

Czechoslovakia. Czechoslovakia increased its pulp exports from 28,000 tons in 1946 to 38,000 tons in 1948, a volume representing about 30 percent of the prewar rate. Total pulp exports for 1949 are expected to stand at about the 1948 level. Czechoslovak pulp producers have recently made efforts to extend their exports to the U.S. market.

Importing Countries

With the exception of *Belgium*, European countries imported somewhat larger quantities of pulp in 1949 than in 1948. The greatest percentage increase is noted for *Italy*, which doubled its previous pulp imports in order to expand its export trade in paper and paper products.

After a temporary slackening on some European paper markets, there is evidence now of a steadily growing demand, and it can be expected that at least as much pulp will be needed in 1950 by European importers as in 1949.

Prices

The price decline on the pulp market since the fall of 1948 has been very far-reaching. This is illustrated by the course of Finnish wood pulp prices during 1949 on the United States market, shown in Table 3.

Table 3.—Finnish Wood Pulp Prices, U.S. Market, 1949

Grade	1949 Prices			
	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
	(U.S. dollars per short ton)			
Bleached sulphite	165.00 Dock	132.50 F.A.	118.00 F.A.	118.00 F.A.
Unbleached sulphite	140.00 "	124.50 "	100.00 "	100.00 "
Unbleached sulphate	127.50 "	112.50 "	85.00 "	82.50 "
Groundwood	85.00 "	75.00 Dock	65.00 "	65.00 "

Note: Dock—price on dock; F.A.—cost of inland freight to purchaser's mill absorbed by the seller.

The reduction in prices in Finnish markkas can also be illustrated as follows: While the volume of sulphite wood pulp exports in 1949 increased 21 percent over 1948, the value in markkas decreased 5 percent; the volume of sulphate wood pulp exports in 1949 decreased 6 percent from 1948, but their value decreased 28 percent.

After the waiving of the export fee in Sweden in September 1948, the Swedish exporters immediately

reduced their prices in the United States, but not to the levels of the American domestic prices. The other exporting countries shortly followed suit. However, the attempt to win back the American market by a radical price reduction failed, and only resulted in hesitation on the part of buyers in anticipation of further price cuts.

In the spring of 1949, Finnish and Swedish producers reduced their prices further to approximately the American level, without making greater sales. United States and Canadian domestic quotations were reduced at the same time, partly to offset this competition from Europe.

As soon as it was clear that Northern European sales efforts on the U. S. market had failed, quotations in Europe were also lowered; however, prices remained slightly higher than the American prices. At this stage American exports to Western Europe against Marshall Plan dollars, although the quantities involved were very small, contributed to lowering all market prices for pulp to approximately the American level.

At the close of 1949, the steady market for wood pulp in the United States in practically all categories, together with an approximate supply-demand balance in most grades, led to a greater firmness in world wood pulp prices.

Unbleached sulphite sold in late 1949 at $85-$90 per short ton, and unbleached kraft at $75. These figures, however, are an improvement over the minimum levels prevailing immediately after the market uncertainties which followed the currency devaluations. At that time unbleached grades sold at $10-$15 per short ton less.

On the U.S. market, bleached kraft was in the strongest position, while bleached sulphite appeared adequate to current demand. Small tonnages of Austrian bleached sulphites were in the market at $107-$110 per short ton on dock. Unbleached krafts, owing to continuous demand by nonintegrated mills, moved into a strong position, and Northern krafts were able to command their prices at quoted contract levels. Pulp contract prices on the U.S. market during the first quarter of 1950 are shown in Table 4.

TABLE 4.—PULP CONTRACT PRICES ON U.S. MARKET, FIRST QUARTER 1950[1]

Grade	United States	Canada	Sweden (on dock Atlantic ports)
	(*Dollars per short ton*)		
Bleached sulphate	118.00/126.00	126.00/—	125.00/128.00
Unbleached Northern sulphate	...	82.50/105.00	82.50/ 85.00
Unbleached Southern sulphate	80.00/ 82.50	...	...
Bleached sulphite, softwood	118.00/—	118.00/—	118.00/—
Unbleached sulphite	100.00/	100.00/	100.00/—

... Not available.

[1]U.S. and Canadian wood pulp delivered prices with varying freight allowances. Full freight allowances are allowed on Northern European pulp. Finnish and Norwegian pulp prices are reported to be competitive with U.S. domestic grades.

Canadian and European producers have so far shown no inclination to lower their prices on the U.S. market under the minimum levels of domestic quotations; and in view of the present strong demand in the United States, there is every indication that prices will remain firm, at least for the immediate future.

CONSUMPTION OF WORLD PULP SUPPLIES

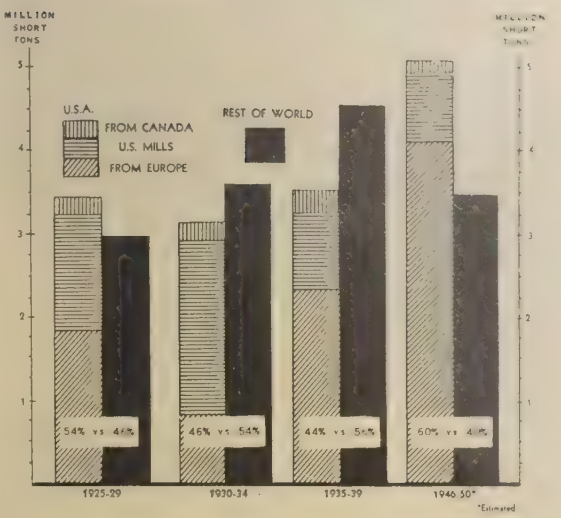


Chart by courtesy of Newsprint Association of Canada

Prices of Swedish pulp on the British market for the fourth quarter of 1949 were agreed upon during September of last year, when the market was still rather weak. Swedish exporters agreed to price reductions, which, for certain categories, were quite considerable.

In recent contracts for delivery in the second quarter of 1950 the prices have been approximately as follows: bleached sulphite £43-£44; easy bleaching sulphite £37-£38; strong sulphite £34-£35; unbleached sulphate £28.10.0 to £30 per ton, c.i.f British ports.

Bulk purchasing by the U.K. Government will come to an end on 1 April 1950.

Wood Pulp Consumption

Since the end of the war, consumption of wood pulp in the United States has shown a great increase, culminating in 1948 in an all-time high of 13.6 million tons for all grades of pulp (almost 65 percent more than in 1939).

However, the decline in paper and paperboard production during the first half of 1949 was reflected in a decreased consumption of wood pulp, and particularly of market pulp. Although pulp consumption during the last three months of 1949 was the highest on record, total consumption for the year was about 7 percent (900,000 tons) lower than in 1948.

Consumption of pulp and pulp products in 1950 will depend upon the aggregate economic and industrial activity of the country as a whole. Recent analyses of the U.S. economy provide promise for a high level of activity and consumer expenditures at least for the first half of 1950. It is thus reasonable to expect that consumption of pulp and pulp products will continue at the present high levels for the same period.

The influence of economic fluctuations in the United States on the world market retarded Europe's recovering pulp consumption during 1949. There are clearly large unsatisfied demands in many European countries, which will grow with further economic recovery.

Consumption of pulp and pulp products in other parts of the world over the next few years will largely depend on the realization of projects for installing new pulping capacity in response to rising effective demand. Technical progress in pulping methods, particularly of tropical hardwoods and other raw materials, holds great promise for the future.

WORLD PAPER TRADE

After the war the tonnage of paper and paper products available for export was considerably below prewar levels, and the requirements of many importing countries could not be satisfied. The paper industry of Central Europe was disrupted, and the Northern European countries were unable to reach their prewar output. Furthermore, their own greatly increased consumption of paper and paper products had considerably reduced the quantities available for export, while the strength of U.S. demand precluded any large North American exports. On the other hand, import demand in many countries was reduced below prewar levels by lowered purchasing power. The largest European importer, the United Kingdom, had restricted its consumption of paper and paper products to a minimum during the war, and many of the governmental controls on imports were continued thereafter. Even now the U.K. import figures are far below those of prewar. In a number of countries, also, the demand for imported paper and paperboard was kept down by the expansion of domestic manufacturing capacity.

However, in most countries effective demand rose more than output during the immediate postwar years. Since 1947 and through 1948 and 1949, although effective demand has still slightly exceeded supply, the situation has become more balanced. This does not mean that balance exists between potential requirements and supply, as UNESCO and FAO have frequently pointed out. International trade, however, is still restricted by numerous impediments, and as long as such conditions prevail, a more even flow of supplies to importing countries is not possible.

Paper prices in general continued to rise up to the end of 1948, when signs of a decline were apparent. During the first half of 1949, order shortages were so pronounced that some Northern European mills had to stop production for short periods.

During the summer of 1949 demand began to pick up. When pulp prices were raised and the effects of devaluation began to influence manufacturing costs, the prices of paper and paperboard had to be increased. This, however, has had no adverse result on effective demand.

NEWSPRINT

Newsprint manufacture accounts for about 28 percent of the world's consumption of wood pulp; and North America uses some three-fifths of the world's newsprint. Newsprint consumption in 1949 in the United States exceeded all previous records with a total of 5,000,000 tons, an increase of 56 percent over the prewar level. This increase has been made possible almost entirely through expansion of Canadian and U.S. output.

United States consumers of newsprint are now obtaining around 80 percent of their supplies from Canadian and Newfoundland mills, compared to 67 percent during 1935-39. The chasm between the dollar and non-dollar countries has been accentuated by devaluation, and the United Kingdom has turned from Canada to Northern Europe for its newsprint supplies.

Production

North America. Production of newsprint in North America reached a new high of 5.5 million tons in 1949, an increase of 1.7 million tons over 1939. As compared with 1948, Canadian production increased by 2.8 percent and United States output by 3.5 percent. This record output, reflecting the still increasing United States demand, was made possible by capacity operation at the mills, technical improvements, and installation of faster machines.

Two newsprint mills have recently been built in the United States. A mill using de-inked newspaper as raw material, recently completed in Indiana, is expected to reach an output of 45 tons daily on a full operating schedule. A plant in Alabama will supply southern newspaper publishers with approximately 270 tons of newsprint daily. The erection of a third mill is proposed in Arkansas.

Europe and U.S.S.R. In 1949 practically all European newsprint-producing countries recorded increases over the preceding year. The most important gain, amounting to more than 140,000 tons, was registered by the United Kingdom; increases for most of the other European countries were on a much more moderate scale.

Despite increases in production of about 300,000 tons between 1947 and 1948, and of over 350,000 tons between 1948 and 1949, there is still much idle capacity; almost 360,000 tons of idle capacity is said to exist in Germany, the United Kingdom, and France, and over 360,000 tons in other European countries, including about 160,000 tons in Northern Europe. The reasons given for this unused capacity are the continued dislocation of world trade, currency difficulties, and shortage of pulpwood.

According to a report dating from the latter part of 1948, the Soviet Government has allocated 400 million rubles for the construction of paper mills in various parts of the Soviet Union. These mills will primarily produce newsprint, of which greatly increased supplies are necessary if the reported goal of 5,600 newspapers, with a circulation of 30 million copies, is to be attained.

Distribution

In 1949, 86 percent of all shipments leaving Canadian newsprint mills went to the United States, 7 percent to other foreign markets, and 7 percent to domestic markets. During 1935-39 the proportions had been 72 percent to the United States, 22 percent to the rest of the world, and 6 percent to domestic purchasers.

The distribution of Canadian export shipments, as between the United States and other destinations, is shown in Table 5.

TABLE 5.—DISTRIBUTION OF CANADIAN NEWSPRINT SHIPMENTS FOR EXPORT

Year	Destination					
	U.S.A.		Others		Total shipments	
	Quantity	Index	Quantity	Index	Quantity	Index
	(1,000 metric tons)					
1935-39 Av.	2,166	100	667	100	2,833	100
1940-45 Av.	2,511	116	515	77	3,026	107
1946	3,232	149	621	93	3,853	136
1947	3,535	163	636	95	4,171	147
1948	3,745	173	484	73	4,229	149
1949	3,974	183	408	61	4,382	154

SOURCE: Newsprint Association of Canada. All figures have been adjusted to include shipments from Newfoundland.

United States imports reported obtained from Canada have jumped from approximately 2,170,000 tons prewar to nearly 3,980,000 tons in 1949. As compared with 1946, the 1949 actual imports from Canada are greater by 820,000 tons.

Canadian newsprint shipments to all destinations other than the United States averaged 667,000 tons during 1935-39. For 1949 such exports are put at 408,000 tons.

Before the war the United Kingdom was Canada's second largest market, taking an average of 270,000 tons from Canada and Newfoundland together for the years 1935-39. During the war, when it was cut off from Northern European supplies, it had to rely exclusively on Canadian supplies. Later, however, because of dollar shortages, its imports from Canada were cut to 90,000 tons a year, and were at about this level for 1949.

According to the latest reports, the United Kingdom will purchase no newsprint from Canada during the first six months of 1950. It will then reconsider its further policy in the light of the exchange balances. This decision will release approximately 90,000 tons of newsprint capacity for other markets.

The United Kingdom is able to seek supplies outside the Canadian market because the Northern European producers are delivering newsprint at a competitive price, and are willing to sell for sterling.

The trade figures of other major importing countries also show significantly the shifting from North American to European sources of supply. Australia, for example, where Canada has traditionally been the main source of imports, is taking substantial tonnages from Northern Europe. In Latin America, while total newsprint imports dropped from an estimated 370,000 tons in 1948 to 330,000 tons in 1949, the share of Canadian shipments decreased from 48 to 34 percent, and Northern European shipments increased proportionately. Argentina has completely cut out newsprint imports from Canada. In recent years there has been a tendency for production in North America to be balanced against the demand within the region. The rift between dollar and non-dollar countries, as regards newsprint distribution, has been widened, leaving the potential requirements of soft currency countries without apparent means of full satisfaction, because Northern European mills and forests cannot indefinitely support the rest of the world, even at its present low levels of consumption.

The distribution of Northern European newsprint exports, prewar and postwar, is shown in Table 6.

CONSUMPTION

Held down by supply shortages during and immediately after the war, consumption of newsprint in the United States has since shown a remarkable sustained rate of increase. As compared with a 1939 volume of 3,220,000 tons, consumption soared to 4,660,000 tons in 1948 and reached an estimated 5,000,000 tons in 1949. At this 1949 level, the increase over the prewar average is nearly 56 percent.

Through the fifteen years preceding the war, the proportion of total world newsprint supplies absorbed by the United States market, as compared with that consumed by other countries, steadily declined, falling from over 57 percent of total world consumption in 1925 to 44 percent in 1935-39. Since the war this trend has been completely reversed, and for 1946-50 it is estimated that the United States will consume 60 percent of the world's supplies.

Comparing the five postwar years 1946-50 with the five prewar years 1935-39, newsprint consumption in the United States has increased by over 1,360,000 tons a year, while consumption in the rest of the world has shown a decrease of over 1,134,000 tons per year.

TABLE 6.—DISTRIBUTION OF NORTHERN EUROPEAN NEWSPRINT EXPORTS, PREWAR AND POSTWAR

Year	Destination									
	U.S.A.		United Kingdom		Latin America		Others		Total	
	Quantity	Index	Quantity	Index	Quantity	Index	Quantity	Index	Quantity	Index
	(1,000 metric tons)									
1935-39 Av.	224	100	121	100	147	100	202	100	694	100
1946	25	11	12	10	105	71	285	141	427	62
1947	103	46	19	16	159	108	211	104	492	71
1948	216	96	29	24	120	82	223	110	588	85
1949*	197	88	62	51	122	83	290	144	671	97

*Estimated.

Pitprops

Situation in Europe

PITPROP supplies through 1949 proved adequate to cover the growing needs of European coal mines. In November 1949 this led the Pitprop Working Party of the ECE Coal Committee at Geneva to discontinue the import allocation system which had been in force since the end of the war. Since increased production and larger imports had resulted in bigger stocks in most countries, a situation forecast by the ECE Timber Committee at the beginning of 1949, no further special measures were considered necessary in the interests of consuming countries; substantial quantities of pitprops could be forthcoming, if really needed, from Canada and the United States.

Production and Consumption

The net pithead production of hard coal again increased in 1949, as shown in Table 1, and consumption of pitprops went up accordingly.

Table 1.—Coal Production

Area	Net pithead production of hard coal		
	1948	1949	1950 estimate
	(*1,000 metric tons*)		
Belgium	26,700	27,800	29,000
Czechoslovakia	17,700	17,000	17,500
France[1]	55,900	65,500	68,800
Germany (Bizone)	88,600	104,800	112,000
Italy	1,000	1,100	1,200
Netherlands	11,000	11,700	11,900
Poland	70,300	73,400	77,000
United Kingdom	[2]198,900	[2]205,900	[2]214,000
Total	470,100	507,200	531,400

Sources: *Monthly Bulletin of Statistics* (Statistical Office of the United Nations) and ECE Coal Committee statistics.

[1]Includes the Saar.
[2]Excluding open cast.

Some coal-producing countries have stepped up domestic pitprop production in an attempt to confine imports, as far as possible, to dimensions which are unobtainable from their own production. Upon the whole, however, domestic production in pitprop consuming countries showed a declining tendency.

Exports

During 1949, the pitprop exports of the main European exporting countries increased considerably and were in the aggregate nearly one million m^3 or about one-third higher than in 1948. In Northern Europe shipping conditions up to the end of 1949 were favorable, so no difficulties were encountered in carrying out the remaining 1949 deliveries; it is reported that only small quantities, if any, were left lying for the winter in the northern ports.

The most interesting change in the pitprop trade picture as compared with the immediate postwar years is the increase in Sweden's exports. This country, which since the early 1930's had not been a large-scale pitprop exporter, shipped about 660,000 m^3 in 1949, compared with 195,000 m^3 in 1948. The sudden expansion was mainly attributable to Sweden's difficulties in disposing of its wood pulp during the first half of the year and the resultant smaller demand for pulpwood. Yugoslavia and Portugal also noticeably increased their pitprop exports. It is understood that Romania also increased its exports, mainly to Turkey, although figures are not available.

Exports from the U.S.S.R. and Eastern Germany, on the other hand, remained relatively insignificant and were no doubt far below potential export capacities. Exports from the U.S.S.R. showed an increase over 1948, perhaps foreshadowing larger future exports, and exports from Eastern Germany (mainly to Western Germany) rose from about 100,000 m^3 in 1948 to 141,000 m^3 in 1949.

Imports

Reports from importing countries for 1949 reflected the clear improvement in the supply situation. The increased imports brought about a general improvement in the consuming countries' stock position as compared to the previous year.

The 1949 import requirements of the Saar, about 490,000 m^3, were filled from German sources, particularly from the French Zone. Some quantities (40,000 m^3) of hardwood pitprops were also delivered by France.

The disastrous forest fires in August 1949 ravaged 70,000 hectares of forest in the Landes, Southern France. The quantities of pitprops available as a result of salvage operations were found to be about 900,000 m^3. Out of this quantity about 650,000 m^3 had been taken up by the French coal mines by the beginning of 1950 and about 145,000 m^3 placed on export markets.

It should be pointed out, moreover, that the latest estimates of timber available as a result of the fires also included about 900,000 m^3 of pulpwood, some part of which might be diverted for use as pitprops if circumstances warranted. The Landes fires, however, may not eliminate the need for imports into France in 1950.

Outlook for 1950

As indicated in Table 1, the planned production of hard coal for 1950 in the main producing countries is about 5 percent higher than for 1949. If this goal is attained, consumption of pitprops should increase accordingly.

The estimates made at the sixth session of the ECE

Timber Committee actually showed an apparent deficit of 0.4 million m³ in pitprop exports likely to be available in 1950 as compared with import requirements. The deficit was noted as amounting to less than 3 percent of estimated requirements for the year. The Committee, however, pointed out that increases in pitprop stocks in certain consumer countries would tend to offset the apparent import deficit.

Taking all factors into consideration, it is believed that stocks and new supplies in 1950 should be adequate to cover consumption.

Export Possibilities of the Main Producing Countries for 1950

Finland and Sweden

These two countries have announced 1950 export availabilities of 1,000,000 m³, viz., Finland 700,000 and Sweden an estimated 300,000 m³. These quantities, however, are likely to be considerably exceeded provided that contracts can be placed with consumer countries. The United Kingdom could take up 525,000 m³ of the Finnish export availabilities and more than the total Swedish forecast.

France

An export availability of 100,000 m³ has been announced. Possible outlets for the supplies made available by the Landes fires, in addition to the United Kingdom and Belgium, are Western Germany, the Ruhr, and Italy. It is felt, however, that a certain portion of the fire-damaged pitwood will have to be sold as pulpwood.

Norway

Norway has announced an export availability of 80,000 m³ for 1950. This quantity, however, may be increased through diversion of pulpwood, as in the other northern exporting countries. The United Kingdom is expected to contract for up to 100,000 m³ for 1950 deliveries.

Central Europe

Austria has announced an export availability of 120,000 m³, Poland 250,000 m³, Switzerland 25,000 m³, and Yugoslavia 175,000 m³. These quantities are likely to be exceeded if more contracts can be placed with consumer countries. The United Kingdom alone could place contracts in 1950 for 250,000 m³ from Poland and 200,000 m³ from Yugoslavia. Furthermore, Belgium is expected to import about 45,000 m³ from Poland.

Portugal

An export availability of 200,000 m³ has been announced, of which 110,000 m³ is supposed to be exported to the United Kingdom.

U.S.S.R. and U.S.S.R. Zone of Germany

An export availability of 1,100,000 m³ from these sources was estimated at the sixth session of the ECE Timber Committee. This figure was based on export arrivals in some of the main consuming countries and on the fact that Poland had to cover its import requirements from these sources. As regards the U.S.S.R. proper, speculations have been made regarding greater exports from this source to the main

Table 2.—European Supplies

Country	1949 preliminary figures				1950 forecast			
	Production	Imports	Exports	New supply	Production	Import requirements	Export availabilities	New supply
	(1,000 m³(r))							
Austria	283	—	72	211	334	—	120	214
Belgium	850	281	11	1,120	850	375	25	1,200
Czechoslovakia	...	...	—	...	670	—	—	670
Finland	[1]1,134	—	1,134	—	700	—	700	—
France[2]	2,500	768	140	3,128	2,900	450	100	3,250
Germany:								
Bizone	3,575	...	—	3,575	3,400	530	300	3,630
French Zone	...	...	...	...				
Hungary	...	...	...	...	100	50	—	150
Ireland	9	—	12	...	11	—	9	2
Italy	111	1	1	111	190	—	—	190
Luxembourg	90	5	52	43	60	10	65	5
Netherlands	80	207		287	115	75	—	190
Norway	101	—	101	—	80	—	80	—
Poland	...	...	250	...	1,866	450	250	2,066
Portugal	212	—	219	...	240	—	200	40
Sweden	[3]660	—	660	—	200	—	[4]300	—
Switzerland	—	—	—	—	25		25	
United Kingdom	[5]636	2,375	—	[5]3,011	[5]630	2,100	—	[5]2,730
Yugoslavia	...	...	189	...	...	—	175	...
Subtotal (est.)	10,690	3,637	2,841	11,486	12,646	4,040	2,349	14,337
From U.S.S.R.	...	...	150	...	...	...	1,100	...
From Canada	...	—	710	...	...	...	300	...
TOTAL (est.)	11,550	3,637	3,701	11,486	14,046	4,040	3,749	14,337

Source: ECE Timber Committee Report of 6 April 1950. Data for "New supply" and totals computed by FAO.
— Not available or not applicable.
- None or negligible.
[1] Volume of exports assumed to be identical with production.
[2] Includes the Saar.
[3] Includes sawn pitwood.
[4] Some exports will be made from stocks.
[5]

consuming countries in the course of 1950, the United Kingdom for instance expecting around 125,000 m³. It is, however, very difficult to confirm these speculations, as the present Soviet plans for pitprop exports are completely unknown.

Western Germany

An export availability of 300,000 m³ has been announced for 1950. This quantity, however, probably applies to the French Zone only, and is likely to be exported almost entirely to the Saar. The figure quoted seems to include a carry-over of 140,000 m³ from 1949 contracts, but does not include quantities contracted before 1949 which are still undelivered.

OUTLOOK FOR 1951

The ECE Timber Committee has obtained information from countries as to estimated production, import requirements, and export possibilities for 1951. The tentative figures submitted, when totaled, showed a pitprop deficit of slightly over one million m³ in export supplies as contrasted with import requirements. Because of the tentative nature of the figures and the tendency of importing countries to overstate requirements and exporting countries to be cautious, the Timber Committee was not alarmed at the apparent deficit. In addition, it noted that changes in the requirements for pulpwood could have considerable effect on pitprop availabilities.

Personalities

• Harry T. Gisborne, Chief of the Division of Forest Fire Research, Northern Rocky Mountain Forest and Range Experiment Station, died of a heart attack on 9 November 1949 at Gates of the Mountain, Helena National Forest, Montana. Mr. Gisborne was internationally known for his pioneer work in measuring and rating weather factors which influence behavior of forest fires. He developed the system of measuring humidity, fuel moisture, precipitation, and wind velocity which can be translated into numerical terms of fire danger, and designed weather instruments now widely used on forest fire weather stations.

• Luang Samarn Varnakij has been appointed Director-General of the Royal Forestry Department, Thailand, on the retirement of Mom Chao Subsuekhswasti Suekhswasti.

• Ingenieur F. W. Malsch has been appointed Director of the State Forest Service in the Netherlands. He succeeds Dr. J. A. van Steijn, who retired on 1 October 1949 after a long and distinguished career in forestry.

• Arthur Upson, Director of the Tropical Region of the U. S. Forest Service and of the Insular Forest Service in Puerto Rico since 1943, has accepted an assignment to do special wood utilization work at the California Forest Experiment Station. He has been succeeded by Henry B. Bosworth, Supervisor of the Texas National Forests.

The Work of FAO

FAO's Program for Forestry and Forest Products

As reviewed by the Fifth Session of the FAO Conference

At the Fifth Session of the FAO Conference held in Washington in November 1949, the Director-General of FAO and the Director of the Division of Forestry and Forest Products submitted to the delegates a number of documents outlining the work — past, present and future — of the Organization in regard to forestry and forest products. A condensation of these documents is presented for the information of the readers of UNASYLVA.

THE field of forestry is very wide compared with the resources of FAO and so many projects have been recommended by successive sessions of the FAO Conference, by regional conferences, and by meetings of specialists that the most rigorous selection of items for the future work program was necessary. The Director-General had to select a relatively few key projects, placing the emphasis on those which were likely to have early and practical results and in which FAO could take some effective action.

After thorough discussion by delegates to the last FAO Conference, general approval was given to the program of work for 1950.

One-third of the world's population living in Europe, North America, Oceania, and the Soviet Union consumes 80 percent of all construction timber and 90 percent of all pulp. Even in these regions, the demand for more and better housing and for more paper will persist and grow stronger. The 1,500 million people living in the underdeveloped regions need wood too. Economic progress during the next decades will be accompanied by increases in the effective demand for forest products of all kinds by the less developed nations. A progressive expansion of the world's wood supplies, achieved in conjunction with efficient management of the world's forest resources, therefore constitutes an outstanding objective of FAO.

For practical purposes the basic methods for achieving a progressive increase in wood supplies may be grouped under three headings:

1. *Reduction of waste and loss* through adequate forest protection, better logging methods, improved industrial conversion and preservation, more efficient domestic and international distribution, and scientific utilization. The combined effects of these measures could be to double present supplies of forest products without any increase in total drain on the forest.

2. *Increased yields from existing forests* by application of improved silvicultural techniques to forests now under management, the opening up and rational development of presently inaccessible forests, improvement in productivity of degraded forests, and efficient management of all forests in accordance with forestry principles. So far only one-third of the world's forests have been taken into use, and, because of inadequate management, the average yield is not quite one ton per hectare per year, compared with a possible yield of two tons.

3. *Increased supplies from new forests* through afforestation of bare soils (which will also assist in the restoration of soil fertility, maintenance of adequate water supplies, and restraint of soil erosion), and reforestation of denuded forest soils. It is believed that such afforestation and reforestation should and could extend to many hundred millions of hectares.

Almost every country in the world offers scope for the application of the above basic methods. Yet from country to country and especially in different regions of the world there are considerable differences in emphasis. FAO has evolved a pattern of action in three phases: first, visits by staff members to study and define the problems of the region; second, the calling of a regional conference to provide governments with an opportunity to reach an agreed view about forestry problems of their region and to decide on the action necessary to solve them; third, the setting up of permanent intergovernmental machinery, assisted by a regional working group staffed by FAO officers.

DEVELOPMENT OF NATIONAL FORESTRY PROGRAMS

Reduction of Loss and Waste

Activities during 1949

Advisory assistance has been given several governments on providing adequate forest protection and in establishing forest fire control organizations.

FAO has received and analyzed lists of requirements for forest industry equipment from various member countries and collected data on all types of logging and transport equipment and processing machinery produced in the major manufacturing countries. This documentation has been made use of by the representatives of many countries contemplating the modernization of their extraction methods.

A study on the *More Rational Use of Wood* has been made by the Chairman of FAO's Technical Committee on Mechanical Wood Technology. This deals with practices in European countries for the elimination of waste in the conversion and utilization of timber, and embodies a code of measures to save timber in building and construction through better design and technique. If adopted by governments, the recommendations contained in this report will go far to reduce timber requirements while assuring more efficient utilization of the supplies available.

1950 Program

- Arrangements will be made for regional forestry offices to act as centers for the collection of information with regard to the outbreak and development of epidemics and to notify all countries which might be threatened.
- FAO has assembled and analyzed methods of forest fire control worked out in various countries. The information collected will be published in 1950, as an aid to governments in organizing and putting into practice programs of forest fire control where these are needed.
- Great confusion now exists with respect to the local names of many trees and the timber obtained from them, and this confusion seriously retards efforts to establish markets for many useful species. An attempt to harmonize nomenclature of important species will be made with the co-operation of various experts. The project will be of primary value to underdeveloped countries and to users of tropical hardwoods.
- FAO intends to carry forward the work toward standardization with respect to structural grades, sizes, and trade names of timbers. A special meeting will

be held in the Far East in the middle of 1950. In Latin America standardization of hardwood and softwood lumber sizes will continue to be studied by the Latin American countries.

• A staff study will be made of past experience in feeding livestock with fodder derived from wood waste, and the possibility and probable costs for extending its production to new regions. Information collected will be published.

• The Fifth Session of the FAO Conference noted with approval the work of FAO with regard to forestry requisites and urged its continuation and extension to all phases of logging, transportation, the information on types and procure- and primary conversion equipment, since ment sources of such equipment can be of great value to member governments, especially in connection with the expanded program for technical assistance. Arrangements for publication of the data assembled will be explored.

Increased Yields from Existing Forests

Activities during 1949

Technical advice on forest utilization plans has been given to several governments. The FAO missions to Poland and Thailand were accompanied by forestry experts whose recommendations cover every phase of forest development. Missions have now visited Nicaragua and Austria to study the forest development possibilities in those countries. Special reports have been prepared by staff officers on forest development prospects in the Paraná pine region of Brazil, in areas of Colombia, and on general possibilities for agricultural and forestry development and for settlement of the Tingo Maria and Pucalpa regions in Peru. A report has been prepared also on colonization and development prospects in the Amazon basin. Visits by FAO staff members to discuss national forestry programs with authorities concerned have been made to most of the countries of the Far East, Latin America, Europe, Australia, and New Zealand.

In Europe a tangible result of the ECE Timber Committee's work has been the so-called "timber equipment project" designed to increase European softwood exports by making available to certain producing countries several million dollars worth of forestry equipment. This project developed by FAO, the ECE Timber Committee, and the International Bank, has resulted in the Bank making loans totaling US$5 million to Yugoslavia and Finland. At the same time the project has resulted in bilateral agreements between European equipment-manufacturing countries and timber-producing countries.

As part of a project that is still in a preliminary stage, a card index has been built up covering between 400 and 500 technicians who wish to emigrate from Europe and are registered as "displaced persons" with the International Refugee Organization. FAO is circularizing certain countries in the Far East and Latin America asking for their requirements for technicians. When this information is obtained, lists of names will be submitted to the governments concerned, who can then make arrangements directly with IRO, if they wish to employ any of the persons listed.

The Latin-American Forestry and Forest Products Commission has studied the question of creating a Latin-American Research and Training Institute as recommended at the Teresopolis Conference in 1948 and made these recommendations:

— Plan the institute as a technical body, based on a complete research program and establish it as soon as possible;

— Confine the educational work to advanced and specialized training;

Establish a central unit in a readily accessible location and have five regional research stations, for Central America, the tropical Andes, the Amazon River Valley, the Rivers Plata and Paraná, and the Southern Andes.

FAO's Latin-American Working Group for Forestry and Forest Products has since prepared a draft report on the organization and functioning of the institute, including a budget.

1950 Program

• Agreement on certification is needed in order that forest authorities who may purchase seeds and plants from other countries can be assured of the origin and qualities of the material. National regulations on plant quarantine are rightly intended to prevent the introduction of injurious insects and plant diseases. In some cases, however, they may hinder the movement of badly needed forest planting stock. FAO is investigating existing conditions regarding certification and quarantine and will prepare draft agreements for consideration by regional Forestry and Forest Products Commissions.

• FAO will continue to co-operate with the International Refugee Organization, the International Labour Organisation, and other organizations in an effort to put into effect the recommendation of the Teresopolis Conference that professional foresters and other technicians anxious to emigrate from Europe be given assistance in moving to Latin America. Systematic investigations of the needs of Latin-American countries for such personnel will be continued.

• Efforts will be continued towards the establishment of the Latin-American Forest Research and Training Institute within the next two years.

• FAO will study possible locations for the setting up of integrated forest industries with particular reference to Latin America.

• A systematic study of modern forest inventory methods, commenced in 1949, will be continued. This will include ground surveys, air surveys, and methods of using them in combinations. At the request of many member governments, early publication of the information collected will be undertaken.

• Advice will continue to be given to governments regarding specific forest development plans, and technical missions will be organized on request.

Increased Supplies from New Forests

Activities during 1949

In the recommendations of the conference held at Mysore in 1949 much emphasis was laid on measures for soil conservation, control of grazing to prevent undue interference with forest growth, careful regulation of shifting cultivation by both nomadic and settled populations and its gradual replacement by systems of permanent agriculture, large-scale afforestation and reforestation, and the improvement and modernization of forestry practices in general.

Advice has now been given on the creation of Citizen Conservation Corps as one means of carrying out certain reforestation and afforestation programs.

In Europe reforestation as a means of avalanche and torrent control is being studied by the European Forestry and Forest Products Commission. The Mediterranean Subcommission is studying the introduction of exotic species for reforestation in Mediterranean countries.

1950 Program

• A study is being undertaken of artificial regeneration methods, highly developed in some countries, including introducing new and valuable species, securing seed supplies, operating tree nurseries, and conducting planting operations. The information collected will be published, if possible, in 1950.

• A staff study will be undertaken of the problems arising from the damage done to forests by uncontrolled grazing with a view to improving land utilization through co-ordination of grazing and forestry. The study will stress the importance of proper land use and adequate vegetative cover, not only from the standpoint of grass feed for cattle but also for watershed protection. The Conference on Land Utilization in Tropical Regions to be held in the summer of 1950 in Ceylon, in addition to the agricultural aspects, will, it is hoped, provide full opportunity for discussion of the various forestry aspects of the problem.

• FAO will start demonstration projects early in 1950 in Cyprus to train technicians from Near East countries in soil conservation and reforestation work. An advisory mission will also be undertaken to various countries of the region in 1950, and possibly also to countries of Mediterranean Europe.

Promotion of Regional Forest Policies

Europe—Activities to end of 1949

In Europe the postwar problem, as it appeared from a firsthand check of the situation, was as follows: Real timber needs were enormous and an acute timber crisis seemed inevitable. Most countries, lacking foreign exchange, had to lower their import demands to under half of what they really needed.

To help solve the problem FAO arranged for 27 European nations to get together at the International Timber Conference at Marianske-Lazne. Here it was established that in 1948 Europe would need about three million more standards of lumber than it could possibly obtain under existing conditions. A bold step had to be taken. The nations agreed to cut 10 percent more trees than they had planned and to use lumber only where it was absolutely necessary. This gave Europe about two and a half million extra standards of badly needed timber that year.

However, this drastic solution meant a further drain on the already depleted

forests of Europe. FAO therefore set up a European Forestry and Forest Products Commission, which has the responsibility of promoting all aspects of good forest management. The large-scale regeneration and replanting of forests recommended at Marianske-Lazne to offset the temporary drastic increase in cuttings are now being carried out.

While the FAO program was thus being put into practice, FAO and the Economic Commission for Europe set up a Timber Committee within the framework of ECE to continue work on the emergency problems of the European timber supply. Towards the end of 1949, the gap between Europe's immediate timber needs and supplies, which two years previously had seemed one of the most alarming aspects of European reconstruction, was temporarily closed. Now the task is to obtain more timber for the longer term needs of the European communities. (The balancing of supplies and demand is referred to later under the section on commodity problems.)

Latin America—Activities during 1948-49

In Latin America the same program was followed. An over-all appraisal was made of the timber situation. It was estimated that the virgin forests of Latin America covered over 850 million hectares of land, made up of a great variety of species, but that despite this wealth, Latin America imported perhaps twice as much wood as it exported. The problem was to discover how these timber lands could be developed. In May 1948, 18 countries attended the Latin-American Conference on Forestry and Forest Products at Teresopolis, Brazil.

The achievement of the Teresopolis Conference was the unanimous agreement of all interested governments of Latin America to press forward with the establishment of concrete action programs of development. Aided by FAO, the countries started listing their immediate equipment and credit requirements. They recognized the need for complete inventories of their forest resources, the extension of national forest services, and the setting up of research and training facilities on an international basis for all Latin-American countries. The nature of the obstacles to be overcome is well illustrated by the problem of training sufficient foresters. Latin America needs over 1,000 professional and over 2,000 semi-professional trained foresters to assure the proper management of its forest resources. Yet, today there are only some 300 professional and 450 semi-professional foresters at work, and many of these need more intensive training.

To keep in intimate touch with the national forestry plans, FAO set up a permanent Forestry and Forest Products Office for Latin America in Rio de Janeiro early in 1949. With the establishment of a Latin-American Forestry and Forest Products Commission, which has already held two sessions, FAO's preparatory action was completed for this region.

At its first meeting this Commission adopted an initial report on the amount of capital and equipment needed for the development of the continental forests. Further investigation revealed another aspect of the question, namely, that lack of equipment is not the real obstacle to development. Before equipment can be used there must be an industry capable of using it, and at present such an industry can be found only in a few instances, and on a very small scale.

It is hoped to establish one or two demonstration projects of integrated forest industries on a commercial scale. This can be achieved by gradually building up a series of complementary industries such as a sawmill, a plywood mill, a pulp mill, and possibly plants capable of manufacturing a number of chemical products. In this way the waste from one operation becomes raw material for the others, and yields, which in isolated industries are as low as 20 percent of the volume of wood cut, can be raised to 60 or 80 percent.

This approach could supply the key to open up one of the world's largest storehouses of renewable wealth, capable of supplying almost any kind of product, both for the home needs of the people of Latin America and for export to other continents.

Asia and the Far East—Activities during 1949

The Far East is characterized by areas of abundance and many more of extreme poverty of forest resources. The very dense populations in some countries of this region have to get along with a small fraction of the wood available to the people of Europe or the Americas. This shortage of wood is largely due to centuries of forest destruction and poor management. So great has been the need for food in many countries that cultivation of crops has been attempted on hillsides on which forests should never have been cut. In many areas, forests have been completely cut down and the areas they once occupied are now barren and infertile. The resulting widespread erosion of the farm lands has today reached alarming proportions and calls for extensive reforestation. Meanwhile, through the sound development of the remaining unexploited forests, the increase of timber exports from the more heavily forested areas to other parts of the region, and the better use of existing supplies, much can be done to relieve the two most urgent needs, namely, fuelwood and cheap lumber for housing and other construction work.

In this region FAO has completed the first two phases of its program—a survey of the problems of the region, and the calling of a regional conference to discuss these problems and decide on ways of solving them. After preliminary contacts had been made with forestry officials of the Far East, a Forestry and Timber Utilization Conference was called at Mysore, India, in 1949, the first international meeting ever held on the forestry problems of Asia and the Pacific.

On the immediate problem of getting more fuelwood and charcoal to the villages, the delegates at this Conference agreed on a variety of measures for governments to translate into action. Much more timber is available than is generally recognized, but it must be moved from areas of plenty to areas of scarcity and it must be used economically. Modern charcoal kilns and modern sawmills would reduce waste in the use of wood and thus stretch available supplies.

On the outstanding problem of soil erosion control, the Conference asked each government of the region to set up a central authority to plan and carry out good land use and soil conservation practices. It proposed that laws be passed in each country enabling the government to act whenever these practices are neglected, either on state owned or private lands. It also called for bold schemes for protecting forests at the headwaters of the great rivers of this region, as well as for large-scale reforestation projects. All these measures will be promoted actively during the third phase of the program which starts in 1950, with the setting up of the Asia and Far East Forestry and Forest Products Commission.

1950 Program

- Sessions of the three regional Forestry and Forest Products Commissions will be held towards the end of 1950. These sessions will amongst other topics initiate consideration of means of arriving at co-ordinated regional forest policies.
- A statement of basic principles of forest policy is now being prepared by FAO to assist member governments in the formulation of their national forest policies and in the application of such principles to their forestry programs. This statement will be submitted for consideration to the 1950 sessions of the regional Commissions and subsequently, with their comments, to the next session of the Conference of FAO.
- The Mediterranean Subcommission of the European Commission will hold its second meeting in Algiers in May 1950.
- Work will continue on establishing the principles on which governments should determine and define that area of their country's whole forest domain which should be maintained as "managed forest" in the interests of the national economy.

Basic Services

No intelligent plans for the systematic increase of wood production or for the efficient management of forests can be made without reliable and periodic information on forest resources, supplies of forest products, present and prospective needs in various countries, and general technological progress. There are, therefore, certain basic services which FAO must provide.

Statistics

Activities to end of 1949

In the field of forestry and forest products, FAO has undertaken and published an inventory of world forest resources, three statistical yearbooks on production, consumption, and international trade in forest products, and with ECE has developed quarterly timber statistics for Europe.

1950 Program

- Forest products statistics questionnaires will be distributed to all governments early in the year and the Yearbook of Forest Products Statistics—1950 will be published towards the end of the year.
- Quarterly issues of the ECE/FAO Timber Statistics Bulletin will be published at Geneva. Besides statistical information each issue contains market reports covering most countries of Europe.

• Studies will be made of wood consumption trends in selected countries in an effort to remedy the present lack of direct statistics which causes serious difficulties in estimating human needs for forest products. These studies will be undertaken in conjunction with other continuing activities in the field of statistics and research.

• A European conference on forestry and forest products statistics will be arranged for early in 1951 to devise improved means for complying with particular European needs in a manner that will permit the inclusion of the statistical results within a general framework of statistical procedure adapted for worldwide use. In the light of the findings of the conference and the desires of governments in other regions, further regional conferences may be convened.

• Data on farm forests and forest products industries will be collected in the course of the 1950 World Census of Agriculture.

Publications

Activities to end of 1949

The Division has developed UNASYLVA, a review of forestry and forest products, as its medium for keeping in touch with officials, specialists, forest industries, and the timber trade of all countries. Appearing in English, French, and Spanish editions, UNASYLVA performs a variety of functions, including (*a*) the discussion of FAO's major objectives; (*b*) publication of commodity reports; (*c*) spreading of regular information about the activities of FAO and its Division of Forestry and Forest Products; (*d*) reporting on current developments affecting forestry and forest products in all countries of the world. Six issues of UNASYLVA were published in 1948 (Vol. II) and six issues in 1949 (Vol. III). Arrangements have been made for the regular issuance of an international bibliography of forestry and forest products publications. This is distributed with UNASYLVA.

1950 Program

• UNASYLVA will be published on a quarterly basis through 1950 (Vol. IV).

• A study of existing education and training facilities in forestry, started under the 1949 program, is nearing completion and will appear in UNASYLVA. More general studies on extension work in forestry and forest co-operatives are also to appear.

• In addition, a study completed in 1949 of the essential elements of policy, law, and administration for different types of national forestry situations and various stages of forest development will be published in 1950.

• Means are being explored of disseminating technical information with the help of microfilm reproduction, while making sure that these activities create no conflict with copyright regulations and the legitimate interests of publishers and authors of technical publications.

• The cataloguing and expansion of the former CIS Forestry Library, now established at the Palais des Nations, Geneva, will be continued. This extensive collection is at the service of member nations for reference purposes.

Technical Consultations

Activities to end of 1949

While new technical knowledge can only be applied at the regional and national levels, it is important to centralize at headquarters the collection and dissemination of new knowledge and the results of research. For technical advice FAO relies strongly on committees of individual experts, since its staff is neither competent nor expected to undertake its own research in the major technical fields. Such technical committees, meeting as necessary, have been established for: (*a*) Forestry Education, (*b*) Forest Research, (*c*) Unexploited Forests, (*d*) Mechanical Wood Technology, and (*e*) Wood Chemistry.

The Committee on Forestry Education held an informal meeting in July 1949 at Helsinki to consider a study on employment and education in forestry made by the FAO staff. The Committee drew up suggestions for minimum requirements in facilities and staff for organizing forestry schools in countries where they do not now exist.

The Committee on Forest Research has not been active nor will it be unless assignments are given to FAO that cannot be handled by the facilities at the disposal of the International Union of Forest Research Organizations, for which FAO provides secretariat services.

The Committee on Unexploited Forests has held only one meeting, in 1947, at which recommendations to FAO were made on the development of tropical forests, including silvicultural and industrial difficulties, for the guidance of the regional offices in Latin America and the Far East.

The Committee on Wood Chemistry held two meetings in 1948 and one in 1949 to discuss the latest advances in wood chemistry, a science which is capable of making a very substantial contribution to increased supplies of a wide range of new products. It is closely following the development of high-yield pulping methods and the use of new raw materials such as tropical woods, temperate hardwoods, straw and other sources of fibers. At its last meeting the Committee formulated two conclusions of great practical significance: (1) the integration of forest industries is making rapid progress in several countries and no longer raises any technical difficulties; (2) the use of hardwoods and tropical species for the manufacture of paper is now proved possible and has given excellent results. The application of these conclusions, through the Technical Assistance program, might change both the traditional structure of forest industries and also their geographic distribution.

The preliminary efforts of the Committee on Mechanical Wood Technology reached a point in 1948 where FAO was able to call a first world conference on the subject at Geneva in September 1949. This Conference was able to adopt unanimous recommendations regarding the most important strength tests for timber. If countries carry out the recommendations, the rational utilization of wood will have made a big step forward.

Consultations on the international plane were also effected in the summer of 1949 in connection with the Third World Forestry Congress, organized by the Government of Finland, and the United Nations Scientific Conference on the Conservation and Utilization of Resources, held at Lake Success.

1950 Program

• A second conference on Mechanical Wood Technology will be organized, probably for early 1951, to consider progress in standardization with respect to the testing of fiberboard, plywood and related products, and the findings of the experts co-operating with FAO in this field.

• A fifth meeting of the Wood Chemistry Committee will be organized for 1951. Progress reports on the activities of FAO in this field and of the work of members of the Committee will be distributed in 1950.

• Secretariat services will be afforded, through the European regional forestry office, to the International Union of Forest Research Organizations and to the International Poplar Commission.

• The Fifth Session of the FAO Conference commended the General Report of the Third World Forestry Congress to the close attention of all governments. Certain parts of this report contain recommendations for international action. In 1950 FAO will assist in the implementation of these recommendations by such means as may prove practicable.

• In view of the recommendation of the Third World Forestry Congress that FAO call an international meeting on Tropical Forestry, and considering the importance of the subject for the expanded program of Technical Assistance, preliminary consultations on this matter will be held amongst experts attending the Ceylon Conference on Land Utilization in Tropical Regions.

COMMODITY PROBLEMS

Increased production is useless if it is not related to improved consumption. For the most part the desired expansion of production will take place only if producers are assured adequate markets. Despite all evidence of the long-term needs for forest products, there will be times when effective demand is insufficient to absorb available supplies. Surpluses, whether genuine or merely apparent, have most undesirable repercussions upon employment in forests and forest industries, as well as on forest management.

It is therefore a fundamental task of FAO to supply regular information concerning supplies, requirements, and trends with regard to those commodities which fall within its purview.

Activities to end of 1949

Information on commodities has been supplied by periodic reports in UNASYLVA on softwoods, plywood, railway ties, pitprops, fiberboards, and wood pulp, and by quarterly European market reports in the ECE/FAO publication *Timber Statistics*. Special reports were contained in such FAO documents as *State of Food and Agriculture — 1949* and *Report on World Commodity Problems*.

To arrive at a generally agreed view on the situation and prospects for wood

pulp, FAO called a Preparatory Conference on World Pulp Problems at Montreal in April 1949. This was the first important meeting of industry and government representatives from the major pulp producing and consuming countries. The Conference noted that world pulp production had increased from 24 million tons in 1937 to 28 million tons in 1948, and estimated a further expansion to 37 million tons by 1955. Requirements are expected to keep in step with this development, and the estimates show an approximate balance between world production and consumption from 1948 through 1955.

1950 Program

- FAO will continue to keep the world situation and outlook for forest products under continuous review. Regular commodity reports will be published in UNASYLVA, and market reports for European countries in the ECE/FAO Timber Statistics bulletin.
- FAO will continue to provide secretariat services for the ECE Timber Committee which is expected to hold two sessions in 1950.
- The marketing of Latin-American forest products will be followed by the Latin-American Forestry and Forest Products Commission. The Commission for Asia and the Far East will endeavor to ascertain the import requirements and export availabilities of the region, with a view to arriving at a reasonable balance between supplies and demand.
- The world wood pulp situation will be kept under review. It is recognized that there may be difficulties in achieving the desired expansion of output in Europe due to shortage of pulpwood. Special attention will be paid to this aspect.
- Improvement in the statistical background for commodity problems will be attempted as indicated in an earlier section.

Latin-American Forestry and Forest Products Commission

THE second session of the Latin-American Forestry and Forest Products Commission opened on 14 November 1949 at Lima, Peru. Delegates from Bolivia, Chile, Dominican Republic, El Salvador, France, Nicaragua, Paraguay, Peru, United Kingdom, United States of America, and Venezuela attended, together with representatives of the Organization of American States, International Refugee Organization, International Labour Organisation, and Servicio Cooperativo Inter Americano de Producción de Alimentos. Mr. Jorge Succar Rahme, who heads the Forestry Subcommittee of Peru's National FAO Committee, was elected Chairman of the session. The secretariat was provided by FAO's Rio de Janeiro office.

One of the earlier items on the agenda which aroused much discussion was the organization and functioning of the proposed Latin-American Forest Research and Training Institute. The project, as drawn up by FAO, was approved in principle, so that negotiations can now go forward with the governments which have made offers for location of the Institute and the regional experiment stations, and arrangements can be made for financing the whole undertaking. A proposition to establish a Soil Conservation Institute had been put forward at another FAO meeting; the Commission felt that a multiplicity of separate institutes must be avoided and suggested that problems of soil conservation might well be taken care of by a division of the Forest Research and Training Institute.

Further progress was made regarding the course which the development of forest production and the timber trade should take in Latin America. The secretariat was directed to obtain further information on specifications, available quantities, and prices of logging and industrial equipment required by several countries; and the Commission laid stress on the great need for an expansion of technical assistance, which FAO could properly undertake under the new United Nations Technical Assistance program. It was pointed out that trade must be developed in all forest products — not only softwoods, although the emphasis was apt to be put on them, but also hardwoods and secondary products for which good markets can be found through concerted action by all interested parties. Grading practices presently in use in Europe and North America are to be made widely known in Latin America.

With regard to standardization of dimensions of sawn lumber, it appeared that most Latin-American countries officially used the metric system while the lumber trade in the same countries used the board foot as a unit. The Commission recommended that one system be adopted after consultation with the Pan-American Committee on Technical Standards. Standardized commercial dimensions and descriptive terms were suggested for hardwood lumber, and a preliminary list drawn up of uniform trade names for the more common timbers.

Some time was spent in considering ways of improving forestry statistics. The Commission recommended that countries centralize responsibility for the compilation of such statistics in a single office or official who could communicate directly with FAO. Statistical matters will probably be considered by a special meeting to be called at a later date, in keeping with a recommendation of the Fifth Session of the FAO Conference.

Finally, the Commission heard proposals presented by the governments of Italy and France with regard to recruitment of technical personnel from those countries to work in Latin-American countries; the International Refugee Organization is also closely watching the possibilities for immigration of qualified displaced persons. Progress in this field will again be considered at the next session of the Commission which will be held in Santiago, Chile.

FAO Mission to Nicaragua

IN compliance with a request of the Government of Nicaragua, the Director General of FAO appointed a technical mission to study the agricultural and forestry problems of that country. The Mission was headed by Dr. H. C. Trumble of FAO's Division of Agriculture, accompanied by Dr. R. E. Patterson of the Texas Agricultural and Mechanical College, specialist in livestock and grazing, and Mr. R. D. Garver, Chief of the Forest Survey of the U. S. Forest Service. Mr. Horacio Recart of FAO's Division of Forestry and Forest Products acted as technical secretary.

The Mission was away for two months and returned in February 1950. Accompanied by officials appointed by the Nicaraguan Government, members of the Mission made extensive trips throughout the country, familiarizing themselves with the agricultural and forest conditions found in the different regions. A general reconnaissance was first made by plane, followed by journeys by car, jeep, boat, and mules to reach most of the agricultural and forest lands of the country. Contact was made in the field with numerous farmers, industrialists, and government officials who furnished valuable information on the problems facing their work. Visits to the extensive forests of the Atlantic watershed and the Pacific slopes and to numerous sawmills and wood industries were made as part of the study of the prospects for the utilization of the country's forest resources.

Since the experience gained in the adjoining countries could have a bearing on the development of Nicaraguan agriculture, the Mission paid short visits to Costa Rica, Honduras, and El Salvador. The Instituto Interamericano de Ciencias Agrícolas in Costa Rica, the Escuela Agrícola Panamericana in Honduras, and the Centro Nacional de Agronomía, directed by the Office of Foreign Agricultural Relations of the U.S. Department of Agriculture in co-operation with the Government of El Salvador, furnished much useful information concerning the work carried out in the respective countries in the fields of research, technical assistance, and education.

The work of the Mission in Nicaragua was greatly facilitated by the co-operation received from the Government, non-governmental institutions, and private individuals.

The Mission's report and recommendations will be published both in English and Spanish.

News of the World

The items appearing here are condensed selections of news thought to be of interest to readers of UNASYLVA. *They are grouped alphabetically by countries under headings currently used by the Division of Forestry and Forest Products for reference purposes. The Editor will be glad to receive direct from readers authenticated items of interest and of news value for this part of the review.*

General

MALAYA

• Forest research in Malaya is centered in the Forest Research Institute at Kepong. The Institute, established in 1928, includes departments of silviculture, botany, and entomology. It also conducts a Forest School, located at Kepong, which gives a yearly course of instruction to members of the field staff of the Department of Forestry. The student body numbers about forty and includes men from adjacent territories as well as the Federation of Malaya. Assistance from other Government services is given on immediate problems on subjects for which there are no departmental specialists, e.g., chemistry, soils, and plant pathology. The future of the research organization and the widening of its scope are under consideration by the Government.

There is a Timber Research Laboratory at Sentul, to be rebuilt soon at Kepong, in which the investigation of the mechanical properties, seasoning, and preservation of Malayan timbers is carried out in conformity with the methods in force at the Forest Products Research Laboratory, Princes Risborough, England.

Contributions to the funds of the Institute and the Timber Research Laboratory are made by the Governments of Sarawak, North Borneo, and Brunei, and work is carried out for these countries.

A series of *Malayan Forest Records* has been published, presenting the results of major research projects. By the beginning of the Japanese war, sixteen of these *Records* had been issued. A quarterly journal, *The Malayan Forester*, is produced by officers of the Department of Forestry; it is not a Government publication although it is issued with the approval of the Government. The journal carries articles of a technical and general nature, the scope of which does not warrant their production as a *Forest Record*. There is also a series entitled *Regional Notes*, contributed by officers of North Borneo, Sarawak, Brunei, and Singapore, which gives current information on forestry topics in these territories.

UNITED KINGDOM

• Educational Publicity Ltd., in collaboration with the Timber Development Association Ltd. of Great Britain, has published the first four in a series of wall charts under the general title *Wood Technology*. These charts form useful visual aids to timber publicity. Chart 1 describes diagrammatically how a tree grows. Charts 2 and 3 deal with the structure of hardwoods and the structural differences between broadleaved trees and conifers. Chart 4 outlines the basic manufacture of plywood. Further wall charts in this series will be issued. In many countries the failure of "wood" to arouse a vivid reaction in the public mind can be traced in large part to inadequate publicity. Charts of this nature are a useful aid towards remedying this situation.

UNION OF SOVIET SOCIALIST REPUBLICS

• *Estonia.*—According to a Soviet report based on prewar statistics (1938-39), and total forest area of prewar Estonia was 931,000 hectares. Of this, 742,000 hectares or 79.8 percent belonged to the state; 1.4 percent to municipalities; 15.6 percent to peasants; and 3.2 percent to various corporations and large estates. By species, 41 percent was pine and 29.2 percent spruce; conifers, therefore, formed the largest part (70 percent) of Estonia's forests. Of the broadleaved species, birch made up 24.6 percent of the total; aspen 2.1 percent; alder 2.2 percent; and other species 0.1 percent. The total annual increment was figured at 3.3 million m^3, and the fellings (including brushwood and stumps) averaged 4 million m^3. The annual increment in the state forests alone was 2,150,000 m^3 and the annual cuttings in 1938-39 were 2,224,700 m^3, consisting of 1,181,800 m^3 of timber, 1,034,500 m^3 of fuelwood and brushwood, and 8,400 m^3 of stumpwood. Forest industries formed an important source of the country's revenue. There were 69 woodworking plants employing some 4,600 men, and 13 pulp and paper plants with 2,300 workers in all. With the exception of one veneer and furniture factory and one cellulose plant, each of which employed more than 1,000 workers, these were small enterprises employing 20 or more people.

It is evident, however, that the Estonian forests, even before the war, had been exploited in excess of their growth. German occupation set them still further back. It may take several decades before their productivity can be restored to normal level.

• *Latvia.*—Forest products have played a large part in the economy of Latvia and its two sister Baltic states, Estonia and Lithuania. Good waterways made it possible to float the timber down to seaports, and exports of timber products, mainly to Britain, were considerable. Latvia had a number of sawmills and woodworking industries, but their production was limited by the lack of raw materials. Its forest area before World War I was estimated at 1,800,000 hectares; of this the bulk, or 1,380,000 hectares, belonged to the state. The composition of the forest, by area, was as follows: pine 52.0 percent; spruce 20.3 percent; birch 18.7 percent; aspen 4.5 percent; black alder 3.4 percent; white alder 0.8 percent; and oak, ash, and basswood 0.3 percent. Nearly three-quarters of the forest was thus made up of conifers. During the 21 years that followed World War I nearly 64 percent of all the original standing timber was cut; this situation was still further aggravated during the German occupation when, according to incomplete estimates, at least 20 million m^3 were felled. All this brought Latvia's forests to the brink of complete exhaustion.

Under the circumstances, the forest administration of Latvia faces a difficult problem of rehabilitating its forests and its lumber industry. It has done a great deal, but more remains to be done. The forests of the Latvian Republic are divided into two classes: (1) Municipal forests, health resorts, forests attached to schools, sanctuary, and protection forests; in these forests only thinnings and such cultural operations as tend to improve the growth are permitted. (2) Forests in which cuttings of commercial character are allowed on condition that they do not exceed in volume the annual growth. It is planned to add some 116,000 hectares to the forests of Class 1 at the expense of the commercial forests. While in some districts the forests are overcut to an extreme degree, amounting to 22 years ahead of the permissible annual cut, in some more distant districts there are many coniferous stands which are overmature. Thus there are 3.6 million m^3 of pine and spruce that should be cut immediately to prevent their deterioration. Some 20 percent of all the birch, 30 percent of the black alder, and 30 percent of the aspen have passed their physical maturity and are good only for firewood. Latvia's forests do not form massive bodies but occur in the form of

"islands." It is impossible, therefore, to concentrate work in one place. All this calls for a radical reorientation of Latvia's forest policies.

• *Lithuania.*—According to a Soviet report based on prewar statistics (1939) the total forest area of prewar Lithuania was 1,200,000 hectares, of which 1,040,000 hectares, or close to 86 percent, were owned by the state and 160,000 hectares by private owners. The principal species were pine (41 percent) and spruce (32 percent), which together made up 73 percent of the forests. Of the broadleaved species, birch accounted for 11 percent, aspen and other soft-wooded species 6 percent, alder 8 percent, oak 1 percent, ash and other hardwood species 1 percent. The total annual increment was estimated at 3.9 million m^3 and the entire growing stock at 139 million m^3. The annual cuttings, even before the war, grossly exceeded annual increment. The war inflicted great losses upon the forests which will affect their productivity for a long time.

Fundamental Science

Ireland

• Despite some disadvantages, particularly its susceptibility to low minimum temperatures and its difficulty of establishment owing to formation of a long tap root, Monterey pine (*Pinus radiata*) has many good qualities. The most important are that it is probably the greatest bulk producer and the fastest growing exotic pine; it does not need a highly fertile soil; it is a good soil-improving species; its dense shade is effective in killing weeds; it is a storm-firm and wind-resistant species; it is a prolific and early seed producer; it withstands sea spray; and, so far, it is not subject to any serious disease.

In the Irish plantations there are several strains of Monterey pine, differing in form and value. In some plots it was found that, in the very early years after establishment, Monterey pine did not grow faster than Scots pine (*Pinus sylvestris*), European larch (*Larix decidua*), and Douglas fir (*Pseudotsuga taxifolia*), but that when vigorous growth did commence, it soon outstripped the other species. More widespread use of Monterey pine to meet the urgent timber problems of Ireland would thus appear to be well worth further investigation.

Silviculture and Management

Malaya

• The destruction of many accessible areas of Malayan forest during the war has brought the problem of their rehabilitation into prominence. In most cases one or more food crops were taken off the ground, which is now covered with secondary growth, the constitution of which varies with the intensity of the cropping and the number of times the growth has been burned. Where young secondary growth has been repeatedly burned for subsequent cultivation, soil degradation is marked, and stumps and roots that would have sent up coppice shoots and suckers have been killed. The resulting delay in obtaining vegetative cover permits the introduction of windborne colonizers such as *Imperata arundinacea*, which, once present, is very difficult to eradicate. The importance, therefore, in the wet tropics of preventing the repeated burning of vegetation for temporary cultivation cannot be overemphasized. Sample plots have been formed to study plant succession in such areas; experimental planting of timber species in secondary growth has also been carried out.

United Kingdom

• The scarcity of transplants and their high cost are directing attention to natural regeneration of forest crops in northern Scotland. Serious deterrents to obtaining natural regeneration are the grazing of woodlands and damage by rabbits and deer. These must be suitably controlled before success can be expected. In one case, that of a beech forest, a good natural regeneration has been obtained by proper cutting of the overwood and fencing, and a substantial net profit has been obtained from the cuttings. Further studies with other species, such as sycamore and Scots pine (*Pinus sylvestris*), are under way.

United States of America

• A new and comprehensive study of the brush conversion problem in California is being undertaken by the California Forest and Range Experiment Station in co-operation with other agencies. For decades, the treatment of many brush lands has been in controversy between range livestock operators and forestry operators, the former generally desiring to burn the brush with the idea of increasing available forage and the latter generally objecting to such practices because of their effect on the watershed value of these hill and mountain lands. The purpose of the studies will be to find out where and how brush can be converted to more useful vegetation without damage to soil and water, and where the conversion will pay its way in terms of stock feed produced.

• The United States Forest Service has just issued a 416-page, illustrated *Woody-Plant Seed Manual* that will be a valuable working tool for seed collectors, nurserymen, and conservationists generally. Based on more than 20 years of research in handling seed for reforestation and afforestation work, it brings together material previously available only in numerous papers and articles. The manual lists 444 species useful for forest plantings, farm woodlot plantings, etc.

• The U. S. Department of Agriculture reports the development of three new chestnut varieties which produce a great quantity of large, sweet nuts and are resistant to chestnut blight. Graft trees of the new varieties, called Naking, Meiling, and Kuling, are already available through tree nurseries. Developed in the Beltsville, Maryland, Research Center, the new trees are the culmination of nearly 40 years of research.

• One purpose of forest management in the Allegheny hardwood forests is to provide hardwood browse as winter forage for deer. Studies show that, in typical winter concentration areas, deer and rabbits are in competition for much of the forage, and that rabbits cause far more damage than do the deer, thus depriving the latter of critical food supplies and leading to losses through starvation.

Silvicultural practices in themselves may not solve the problem of forage supplies for deer so long as the rabbits are uncontrolled, and various suggestions for rabbit control are made to supplement selection cutting practices which will leave a protection canopy and accelerate the increase in density and height growth of the low browse cover. The interaction of forestry practices for wood production and for game production is a particularly acute problem in these forests.

• In the pine region of New Jersey the forest that develops after clearing is usually pine, either short leaf (*Pinus echinata*) or pitch (*P. rigida*), even though adjoining stands may contain both hardwoods and pines. After the pure stands of pine are 15 to 20 years old, scattered oaks begin to appear and progressively assume greater and greater importance as the age of the stands increases. However, pure pine stands, undamaged by severe fires, form the most profitable type of forest. To obtain such stands, proper management practices need to include not only silviculture but prescribed burns as well. If the burns begin when the dominant pines are over 2 inches (5.1 cm.) in diameter, the establishment of pine is favored and that of oak is discouraged. Repeated light fires, at intervals of probably five years until the pine overstory is ready for harvesting, will completely kill the small hardwoods.

In addition, this practice will fully control the subordinate ground cover, which tends to become dense in the absence of fire, so that prescribed burning may be more safely and surely carried out.

Union of Soviet Socialist Republics

• Extensive forest planting in the prairies of the Soviet Union has forced a critical review of existing knowledge on some root-infesting fungi and their effect on the growth of trees and shrubs. That certain mycorhiza which live on the minute hair-roots are essential to the growth of trees is now established beyond any doubt. In the prairie regions, however, where most of the planting is now done, these fungi are lacking in the soils and must be introduced to insure good growth of the forest plantations. This, however, is not easy. To begin with, not all fungi found on the roots of trees are true mycorhiza, and not all are beneficial to growth; some of them are harmful. Yet the botanical identification of these fungi is not well worked out. For pine, larch, spruce, birch, and aspen it is fairly well established that the beneficial mycorhiza comprise species of such genera as *Boletus, Amanita, Cortinarius, Lactarius, Russula,* and *Tricholoma;* and some phases in the development of these fungi have been obtained in pure cultures. The beneficial species for oak and many other trees however, are still undetermined. The inoculation of the soil with pure culture fungi is difficult because thus far only incomplete phases of the fungi have been obtained. The only practical method of inoculation is to transfer soil, at the time of planting, from forest nurseries in which the seedlings are known to be infested with beneficial fungi, although

even in this case it is possible to introduce with the soil some fungi such as *Fusarium*, *Rossellinia*, and others which cause disease among seedlings. How the mycorhiza get into the soil—whether they generate in the soil itself or are carried there by the seed of the trees (for instance, acorns)—is still unknown. Knowledge of the botanical classification, the biology, and the ecology of mycorhiza has now become of practical urgency since the success of the new plantations in the prairie soils depends to a large extent upon the presence of beneficial mycorhiza on the root tips of the trees and shrubs.

• Experiments have been in progress in Uzbekistan on the possibility of large-scale planting of eucalypts for timber production and essential oils and also for the drainage of land having an excessively high water table. Experiments in the Surchan Darjin and Hamangan areas in 1946 and 1947 gave excellent results. Within the next three years it is intended to raise 200,000 eucalypts for planting in Uzbekistan.

INDOCHINA

• The peoples who practice shifting cultivation or *rai* in Indochina can be grouped into two categories: (1) those who get their entire subsistence from *rai*, and (2) those who use *rai* to supplement the ordinary diet which they get from permanent cultivation of paddy.

The latter group of cultivators are not really harmful, as rice from the paddy fields is their main food and they are not nomadic. The area of the *rai* which they clear is relatively small, and they do not cultivate one particular spot for more than a few years. Moreover, as the villagers do not wish to go far from their villages, they take care not to spoil the land too near it, returning to the same area about once in every 8 to 15 years. A few simple rules can easily be devised and established to prevent this kind of *rai* from becoming a menace.

But the problem is quite different for the backward peoples whose only means of subsistence is *rai*. For one thing, these peoples do not know how to make and cultivate paddy fields, and cultivation by the *rai* method is an ancestral tradition with them which it is very difficult to change. Besides, they have been driven from the fertile plains where they were originally established by the more advanced people who now live there; and in the land which they now own, paddy fields can be made and cultivated only with great difficulty. As they must get all their food products from *rai*, these peoples are obliged to clear large areas of forest. They tend to stay a long time in one spot to avoid having to clear new areas of tree growth each year. The long period of cultivation kills the roots of the trees, deprives the soil of the forest seeds which normally would regenerate it, and makes it possible for grasses and weeds, particularly *Imperata cylindrica* and *Eupatoria*, to invade the area and make it relatively sterile.

When after four or five years of cultivation the *rai* is abandoned, there is nothing left to regenerate the forest, as the grass has covered everything. Each dry season it burns, and the fire prevents the forests from re-establishing themselves. The tribes which have abandoned a *rai* do not return to it, as it has become sterile; each year they penetrate deeper and deeper into the forests, which they progressively destroy.

The forests where the destruction takes place are usually situated in high valleys. This has another unfortunate effect as their destruction gives rise to torrents, which carry away the soil and flood the paddy fields in the lower valleys, leaving a sediment of sand and gravel which may make them sterile too. The service which is entrusted with the task of conserving the nation's resources must therefore act quickly and firmly in order to stop this destruction.

Unfortunately, this is difficult, as the food supply of whole tribes is involved. Any arbitrary rules or restrictions applied to these peoples might lead to serious food shortages, and in that case it would be impossible to enforce them, or to ask any tribe to submit to them. Something may be done immediately by limiting the extent of the *rais*, but the tribes must at the same time be taught to use more permanent methods of raising the food they need.

Since 1942, the Forest Service in Indochina, especially in Laos, has devoted its attention to this particular task. It first tried to find lands in the high valley bottoms which could be turned into rice fields, but the areas capable of being used in this way were too small to provide enough food for the tribes. Then a model farm was set up with irrigated terraces for crops, and a demonstrator chosen from among the few men of these tribes who understood this method of agriculture. But this method is a long-range job, for the making of terraces requires an immense amount of work and the villagers can construct them only little by little. It seems, therefore, that for a long time to come, *rai* will be the main source of food supplies for many tribes, and foresters will have to accustom themselves to the idea of rice or maize being one of the principal forest products.

The *rai* may really be compared with a coppice with a short cycle of about 10 years which is destined to provide fuelwood and ash for fertilizer, and finally rice. It is estimated that in Indochina two to three million people live on *rai* systems of agriculture and that between half a million and one million hectares are brought under cultivation each year in this way. As has already been said, the method of working the *rai* may permit the forest to regenerate itself, but also the forest may be rendered incapable of re-establishing itself, thus destroying the very means of existence of the people who use it. It is, therefore, not enough for the forester merely to limit the size of the areas to be cleared. He must first of all decide upon the methods by which they are to be worked, the length of the actual cultivation period, and the rotation or cycle—considerations which have an enormous influence on the future of the forests. He must also make out a real management program for every forest where tribes of this sort are to be found. The result of limiting the *rais* is that the area of forest destruction is restricted only to certain forests. But as this destruction is final, the tribe to which it has been allotted comes finally to the end of its resources. As its people cannot be allowed to die of hunger, new forests have to be given them, to be destroyed in their turn.

In evolving reasonable working methods, there is an immense amount of experience available, gained by tribes who have lived off *rais* for the last century or so. The general rules are simple:

1. *Cultivation period.* Cultivation must be stopped as soon as *Imperata cylindrica* or *Eupatoria* appear; in most cases this will be after about two years. If cultivation is continued beyond this period, the tree roots suffer, grasses multiply, and, as soon as the *rai* is abandoned, they cover everything and strangle all the seedlings and coppice shoots which could regenerate the forests.

2. *Rotation or cycle.* This must be long enough to allow the coppice to suppress the grasses and weeds which have grown up and to allow the forest soil which has been destroyed by the heat of the sun and by being trampled over to rehabilitate itself, at least in part. For a cultivation period of two years, the rotation or cycle should generally be about 10 years.

3. *The maintenance of seed-bearing species.* Some tribes attach great importance to keeping four or five trees per hectare as seed bearers. This practice has the great disadvantage to the cultivator, however, of reducing the yield of rice per hectare because it is next to impossible to grow anything within a circle of 50 meters around a big tree.

4. *The introduction of soil-enriching species.* Some very conclusive tests have been made in introducing quick-growing *Leguminosae*, which rapidly renovate the soil after the *rai* has been cultivated. The best results have been obtained with *Indigofera tasmanii* and *Leucana glauca*. By the introduction of these species, the two-year cultivation period can be extended to five or six years, and the yield is definitely larger. The seeds must be sown at the same time as the last crop sown on the *rai*, and the plants should be cut back when they reach about the height of the crop.

The proper management of forest in combination with crop cultivation is only in its experimental stage, and so far only a few elementary principles have been determined. In view of the number of people who live on *rais* or *taungyas* in Southeast Asia, the improvement of such methods of cultivation must be given at least as much attention by foresters as the management of forests to produce fuelwood.

Mensuration, Increment, and Yield

CANADA

• The Department of Lands and Forests of the province of Alberta has awarded a contract to a commercial air survey company for the aerial surveying and mapping of 180,000 square miles (466,000 km^2) of unmapped provincial territory. The photographs covering 95,000 square miles (246,000 km^2) of forests will also be used in the preparation of a forest inventory. This is reported to be the second largest commercial air survey contract ever granted in Canada. The photography is expected to be completed by the end of 1951.

UNITED STATES OF AMERICA

• The Southern Forest Experiment Station reports the data on forest land acreage and on standing timber volume, growth, and drain collected by the Southern Forest Survey in Mississippi in 1946-1948, and compares the findings with those of the first survey made 14 years earlier. Since the first survey, the standing-timber balance in the state has been swinging from pine to hardwood. Total acreage of pine types has dropped from 9.6 million acres (3,890,000 ha.) to 7.4 million (2,990,000 ha.). Hardwood types now make up 55 percent of the state's 16.5 million acres (6,678,000 ha.) of commercial forest land. Total growing stock is 7,770 million cubic feet (218 million $m^3(r)$). Of this, 57 percent is hardwood and 43 percent softwood, largely pine. In the last 14 years, the rapid increase of small hardwoods has about offset the decline of the large. Softwood growing stock has declined a fifth. Sawlog growing stock totals 29,300 million board feet (133 million $m^3(r)$). Nearly six-tenths of the total is hardwood. Hardwood sawlog volume dropped 20 percent between the two surveys; softwood 29 percent. Declines have been heaviest in the larger tree sizes. Two-thirds of this hardwood sawlog volume is in Grade III logs, and 62 percent of the softwood sawlog volume is in Grade III trees. Twenty-four percent of the total basal area in Mississippi forests is in merchantable trees.

Forest Protection

UNITED STATES OF AMERICA

• A disease of oaks, known as "oak wilt," is now causing much concern in the United States because of the rapidity with which it has spread since 1949 in certain states, particularly in parts of Missouri, northwestern Indiana, and Illinois.

The disease is caused by a fungus described in 1944 and named *Chalara quercina;* it is related to the fungus, *Graphium ulmi*, which causes the Dutch elm disease. The fungus penetrates into the cambium through wounds and spreads rapidly through the entire tree, the effects appearing in the discoloration of the leaves. The upper portion of the crown is usually affected first, but the discoloration quickly spreads downward. In a cross section of a diseased branch, the presence of the fungus is evidenced by a brownish discoloration of the outer sapwood; in fact, it is in this region of the sapwood that the mycelium and spores of the fungus develop. No spores appear on the exterior surfaces of the bark.

It is known that the disease can be spread by natural root grafts (anastomosis) which are very common in oak stands and it has therefore been possible to control the disease to some extent by destroying all oaks within a certain radius of a small infected area. It is not clear how the disease is disseminated from one center of infection to another, since wind borne spores do not seem to be the answer. Many other factors are also not understood so that a systematic attack on the disease is not yet possible.

All species of oak in the United States appear to be susceptible, and infected trees may die within a few weeks; since the roots of the trees are killed, all possibility of regeneration by coppice shoots is eliminated.

• The Southeastern Forest Experiment Station is now able to make quite accurate predictions of the number of fires to be expected in the different National Forest and range district units within its territory. The basis is that, with a large resident population and a relatively constant degree of use, the human risk becomes nearly a constant, particularly when applied to relatively large units. Then the number of fires depends directly on burning conditions or on the ease of ignition, both of which are measurable as a result of past research. Thus, as burning conditions change, the expected number of fires in each unit can be quite accurately predicted.

In retrospect, when the actual number of fires and the expected number are compared, it is possible to identify units in which fire prevention activities are relatively successful or unsuccessful, and thus to provide a guide to the administration in determining where fire prevention efforts must be strengthened.

• Broadcast burning of the large volume of slash resulting from logging operations in the Douglas fir region has long been an accepted practice for reducing fire hazard.

The forestry objectives in burning slash are: (1) To remove small material in which dry-weather fires spread with such speed and heat that they can seldom be controlled inside the slash area; (2) to separate and burn crossed and closely lying logs, so that accidental dry-season fires will be less intense and easier to control; (3) to check the growth of brush; (4) to remove excessive debris that would prevent tree seed from reaching a suitable seed bed; (5) to accomplish the foregoing without scorching adjacent standing timber or causing undue heat injury to the soil and seed trees within the slash area.

A common practice has been to burn slash just before a heavy rain is expected. If the rain occurs, this practice may be desirable; but if the rain does not come, it is often difficult to confine the fire to the slash area. New experiment shows that careful advance planning for each slash area is the first requisite for carrying out the forestry objectives. This includes consideration of the following factors: topography; the relation of the slash area to uncut timber; an advance determination of the weather and fuel moisture conditions; the best time of day to set fires; the size of the crew; the estimated length of time needed for the job; the equipment and communications needed.

Experience now indicates that it is best to wait until about 3 inches (7.6 cm.) of rain has fallen so that there is reasonable certainty that timbered areas will not dry out again. After a variable period, the fine slash will have dried out while the duff in the slash area and the fuels in the adjacent timbered area will still be wet. Under these circumstances, it is possible to carry out most of the burn without danger of fire breaking away. To determine the correct conditions, a systematic examination of the slash and uncut areas is, of course, necessary so that the right conditions may be utilized. Care must be taken to set fires near the most dangerous edges first so that safety strips may be created before the main body is fired; and systematic mop-up after the burning, particularly in dry-weather conditions, is always necessary. The results of this method have been generally successful.

• Tests with DDT spray applied by airplane and helicopter for control of the spruce budworm (*Cacoecia fumiferana*) were recently conducted in the Douglas fir and grand fir stands in Oregon. About 4,200 acres (1,700 ha.) of infested forest were covered. Excellent control was obtained, both with 1 pound of technical grade DDT in 1 gallon of fuel oil per acre (1.1 kg. in 9.4 liters of fuel oil per ha.) and with double this amount per acre. The smaller dosage produced nearly as good results as the larger; a dosage of one-half this amount, however, gave unsatisfactory control.

The spray was applied during the short period in budworm development when the larvae are most vulnerable to insecticidal attack; i.e., when they are actively feeding on the expanding foliage.

The ability of the helicopter to operate from an improvised landing area close to the plots compensated for its limited carrying capacity in comparison with the airplane.

• Additional light on the controversial question of the effect on the desirable wildlife species of spraying with DDT for pest control has been provided by recent tests in the United States. Bull's Island, South Carolina, which is made up of woodland and marsh, was sprayed by airplane at the rate of 3 pounds of DDT per acre (3.4 kg. per ha.). The highest rate of DDT deposit at ground level in the forest was .91 pound per acre (1.1 kg. per ha.), but the average was only .14 pound per acre (0.16 kg. per ha.) because of the interception of the spray by tree crowns. On the treated areas ticks were reduced by 85 percent, whereas on untreated areas their numbers continued to increase. The bird population increased by 10 percent in the treated forest areas and by 19 percent in untreated areas. The treatment had no apparent effect on nesting birds. No reaction to DDT was observed on mammals. Some of the amphibians were killed by the treatment.

A test conducted to determine the critical dosage level and the conditions of application which create definite hazards to wildlife was conducted at the Beltsville Agricultural Research Center with DDT applied at the rate of 5 pounds per acre on an area which, because of a recent burn, is covered with scrub and sapling growth. In the check areas that were laid out and studied, three species of birds were reduced by 80 percent, one by 35 percent, and one was unaffected. The total decrease for the five species was 65 percent. It is believed that this reduction was due to feeding on poisoned insects rather than to a general exodus of birds from the sprayed area.

Logging and Engineering

FINLAND

• Finnish forestry circles have been paying attention to the fact that stumps

left in the forests are, on the average, 4 inches (10.2 cm.) too high. At this height they not only cause inconvenience in hauling; they also represent a very great loss of butt timber of the best quality.

By cutting the stumps 4 inches shorter, a significant quantity of timber that is now abandoned to decay in the forests could be recovered for utilization. The additional amounts that could be recovered annually by this means have been estimated as follows: in sawtimber forests, about 3.3 million cubic feet (93,500 m^3 (r)); in pulpwood and pitprop forests, about 200,000 m^3, piled measure; and in firewood forests, where usually the biggest stumps are left, about 250,000 m^3, piled measure. In terms of prevailing stumpage prices, the total annual saving would correspond to about 105 million markkas, or more than US$450,000.

The Finnish forest owners have been advised, in their own interest, to improve the discipline in forest works and to eliminate the present practice of leaving too high stumps.

Union of Soviet Socialist Republics

• A type of logging is being advocated in the U.S.S.R. which resembles an assembly line process, the different stages of work dovetailing into one another in a continuous succession. This method uses a logging unit of 55 to 60 men, made up of 3 independent gangs of 18 men each. Each gang includes timber cutters and skidders, and, in addition, the unit as a whole has a marker and grader, a sawfiler and repair workers, and a general foreman. Each gang is responsible for felling and skidding to the road or railside timber from a strip of predetermined extent and position. Before logging begins, a basic rate of work is fixed for each strip in accordance with the character of the timber, the density of the stand, the presence or absence of underbrush, etc. As wages are calculated by differential tariffs on the basis of the actual timber cut and delivered by the team as a whole, each member has an interest in both high individual output and in the teamwork necessary to secure continuity of operations. The method has raised productivity by 20 to 40 percent in the Eastern Urals.

• A new truck, powered with a wood gas generator, was put in operation in 1949 in some Soviet forests for transporting logs. What distinguishes it from similar gas generators is that instead of short wood lengths, specially sawed and dried, it uses ordinary fuelwood (mostly birch and aspen 0.5 m. long and 60 x 80 mm. in cross-section) as well as branchwood and dried-out wood of dead trees. In its initial test the truck covered 1,200 kilometers and hauled out 252 m^3 of logs. It carries a load of about 8 m^3 and, when fully loaded, develops a speed of 15 to 16 kilometers per hour. Empty, it can travel at a speed of about 21 kilometers per hour. The tests further showed that the long billets of firewood at a moisture content of about 21 percent burn freely and that the gas generator works easily and does not contain tar substances; it also requires less wood. The use of long billets of ordinary fuelwood for generating the gas greatly simplifies the fuel problem and lessens fuel costs

Conversion

United States of America

• Final statistics on the amount of wood given preservative treatment in the United States during 1948 have been released by the American Wood-Preservers' Association. The record shows the following approximate production of treated ties, piles, and poles: crossties—over 41,000,000 pieces; switch ties—140,000,000 board feet (330,000 m^3 (s)); piles—16,000,000 linear feet (4,880,000 meters); poles—5,500,000 pieces.

As compared with 1947, the amount of lumber and other wood products given fire-retardant treatment in 1948 increased by more than 90 percent, from 5,024,893 board feet (11,860 m^3 (s)) in 1947 to 9,579,787 board feet (22,610 m^3 (s)) in 1948. Stimulated by the extensive use of fire-retardant wood for military structures in World War II, civilian uses have increased rapidly.

Yugoslavia

• Production of charcoal or "carbonization of wood" was practiced for a long time in Yugoslavia by slow burning of wood with little access of air. The Institute of Technology at the University of Zagreb has conducted experiments with speeding up the process by burning the wood at a more rapid rate and learning the effect of such fast burning upon the quality of the charcoal. The following results were recorded:

1) The time necessary for burning by the rapid method is shortened by one-third for a charcoal pile of 20 m^3 capacity.

2) The carbonization of the wood by the speeded-up method gives 2 percent less charcoal.

3) The chemical qualities from the standpoint of ash content, quantity of volatile oils, and the coke residue are of lower quality than when the pile is burned by the old method.

4) The calorific value of the rapidly burned charcoal is 4 percent lower than that of the usual method.

5) The compression strength of the rapidly burned charcoal, because of numerous radial cracks due to the rapid drying in the charcoal pile, is 16 percent lower than that of the charcoal burned by the ordinary method. This makes it unsuitable for use in metallurgy. These results apply only to charcoal piles of 20 m^3. In larger piles (about 130 m^3) the time of completing the carbonization process may be shortened by two-thirds of the time required by the ordinary method.

Utilization

Canada

A recent Canadian magazine gives additional specific information on the question: "In an integration of forest industries, what is the dividing line in the allocation of softwood as saw logs and pulpwood material?" In the forests of Manitoba, the principal species are white and black spruce (*Picea glauca* and *P. mariana*). In general, the former is best suited for lumber or boxwood and the latter for newsprint; but often it is desirable to cut white spruce to a lower diameter than could economically be used as saw logs, and the question arises as to what trees or portions of trees should go into pulpwood.

Decision depends on consideration of many variables, including composition of stand, utilization, marketability and prices, stumpage value when appraised for different products, accessibility, and exploitation facilities. Thus each individual stand or area must be judged on its own merits. Detailed analyses indicate that, in many cases, increased utilization of material formerly left in the woods is feasible on an economic basis.

As to spruce in Manitoba generally, trees 9 inches (23 cm.) and over in diameter will give a greater return in stumpage if made into lumber than if made into pulpwood, while the opposite is true of trees under 9 inches.

Malaya

• Descriptions of important Malayan timbers have been published in the journal, *The Malayan Forester*, during 1948-1949. The information given is that required by commercial users of the timbers and is classified under the following heads: general properties, defects, working qualities, seasoning properties, natural durability and amenability to preservative treatment, mechanical properties (including safe working stresses), importance and uses, confusion with other species, and supplies. To date, keruing (*Dipterocarpus* spp.) has been described in Vol. XI, No. 4; red meranti (*Shorea* spp.) in Vol. XII, No. 2; and white meranti and yellow meranti (both *Shorea* spp.) in Vol. XII, No. 3. A table of allowable working stresses for all common Malayan timbers was included in the first of these numbers.

United Kingdom

• A plant is being installed at Aberdeen, Scotland, to utilize softwood in the round coming from an area of 60 miles (100 km.) radius. Small-sized material from 1¼ inches (3.2 cm.) to 8 inches (20 cm.) in diameter, resulting from thinnings, and lop and top from fellings will be taken, and two defibrators will convert it into a type of pulp to be used as raw material for the manufacture of cardboard. Marketing of such small timber has been one of the most difficult problems of the forest owners, and it has frequently had to be left to rot or has been burnt. The lack of markets has thus been a deterrent to conducting proper cultural operations. The project will start on a scale of about 4,000 tons per annum and, if successful, the output may be doubled. The plant is expected to be in operation by the middle of 1950.

United States of America

• A new and cheaper wallboard that may be used for a wide variety of purposes and that is said to be equal to any wallboard now available has been developed at the Brooklyn Polytechnic Institute. By converting a substance that is already in the wood into a glue which binds sawdust into a smooth, grainless panel, there is no need to add plastic glues. It is believed that a way has been found to reactivate lignin so that under heat it becomes a plastic cement.

A small amount of a relatively cheap chemical is mixed with the wood waste and this chemical puts the lignin to work.

The sawdust and chemical are mixed, put into molds, and electrically heated under pressure. The whole process takes about twelve minutes, and the board can be formed into almost any shape. Boards made in the experimental plant at the Institute are easy to handle, take paint just as well as natural woods, and are superior to natural woods in resistance to rot, moisture, and termites. Sawmills which now burn sawdust can turn it into profit. It is estimated that a plant costing $400,000 can produce $1,000,000 worth of wallboard in a year, handling about 25 short tons (23 metric tons) of wood waste a day.

Economics and Statistics

Australia

• It is estimated that Australian consumption of newsprint in 1950 will be about 160,000 tons. Of this amount, 30,000 tons will come from Tasmania, and orders have been placed so far for 65,000 tons from the United Kingdom, 25,000 tons from Scandinavia, and 5,000 tons from Canada. This leaves 35,000 tons to be procured elsewhere. Poland is offering newsprint in Australia at £35 per ton, but so far no orders have been placed with Polish firms.

British Guiana

• It is reported that a new timber company, formed largely with United States backing, intends to establish a pilot sawmill and begin logging operations in an area which contains good stands of hardwoods. A fairly large development is planned.

Canada

• In his annual report for 1949, the President of the Canadian Pulp and Paper Association stated that the past five-year record of development was an extraordinary one. In 1944 the Canadian pulp and paper industry produced $370 million worth of goods. The year 1949 yielded well over $800 million in total production. Tonnage of all products of the industry rose from about 5½ million tons to more than 8 million tons in the five years. The increased activity of the industry was reflected in a corresponding rise in its contribution to other Canadian activities, such as transportation, chemicals, hydro electric power, food and fodder, and fuel, and in taxes paid to the local, provincial, and federal governments.

Chile

• In 1948, Chile manufactured 8,000 m^3 of plywood, compared with 12,000 m^3 in 1947, when production was approximately at capacity. The outlook for full operations in 1949 was reported to be promising. In the 5 month period, January-May 1949, Chile exported 2,400 m^3 of plywood, principally 3-ply stock in standard-size panels, bonded with casein glue. Argentina, traditionally the largest buyer of Chilean plywood, purchased 1,700 m^3, and shipments to the United Kingdom, normally not a market for Chilean plywood, amounted to 680 m^3. The remainder of Chilean plywood exports went to Bolivia and Peru.

India

• The following information is available concerning the output of government forests in provinces and major states in India. Output from private and smaller state forests is believed to be approximately 25 percent of the figures shown, but no reliable statistics are available. The original data on which the table is based gave volumes with bark and piled volumes of fuelwood, and these figures had to be converted to solid volume without bark.

It is estimated that Pakistan now has about 15 percent of the total forest production of undivided India. As a very large proportion of this production was of coniferous woods, the small production of domestic coniferous woods available to India is further reduced.

Roundwood Output of India's State Forests[1]

Item	1945/46	1946/47	1947/48
	1000 m^3 solid volume without bark		
Total Output	9,550	9,300	8,230
Fuelwood[2]	6,350	6,360	5,860
Logs	2,630	2,389	1,720
Poles	570	560	650

[1]Data for 1945/46 and 1946/47 include production of all forests in the joint Punjab, whereas the figures for 1947/48 do not. Throughout, the figures include data for the whole Eastern States Agency. Data for 1947/48 include estimates for the provinces of Assam, Bihar, and the Eastern States Agency. In 1946/47 total state forest output in the joint Punjab was approximately 850,000 m^3 (r); in 1947/48 production in East Punjab was approximately 520,000 m^3 (r).

[2]The data for Bombay, Hyderabad, Mysore, and Coorg include production of poles.

Malaya

• An interesting development during 1949 has been the very marked increase in the export of graded timber from Malaya. During the first half of 1949, exports of sawn timber amounted to 5,981 tons (of 50 cubic feet), compared with a total of 4,363 tons for the whole of 1948. When it is stated that the largest figure for any prewar year was a little over 2,000 tons, the importance of the increase can be appreciated. The United Kingdom is the principal market, but substantial quantities are also sent to Australia and South Africa.

Ever since the first trial shipments to the United Kingdom were made in 1931, the export trade in Malayan hardwoods has been constantly subject to setbacks. Now, however, progress is being made and the long-term prospects are good, though all difficulties have by no means been overcome.

A flourishing local market serves Singapore, a city of well over half a million inhabitants, and several other towns with populations exceeding one hundred thousand; and outside the large towns the requirements of the well-known tin and rubber industries are considerable. Exports of ungraded "run of the mill" timber to other eastern markets, e.g., China, Red Sea ports, India, are large, amounting in 1948 to over 30,000 tons out of a total production of 250,000 tons of sawn timber. The local and eastern markets are not exacting; timber is scant sawn, seasoning is not usual, and little attention is paid to minor defects and blemishes. As a result, interest of local sawmillers in the production of timber for high-class markets has hitherto been no more than lukewarm, the extra profit for the trouble involved being negligible. Since the war, however, there has been a change of outlook; milling capacity has greatly increased, competition is keener, and the industry generally is looking for new markets. Any factors tending to increase local prices will retard development of the export trade, but if the price is favorable, and not upset by higher ocean freight rates (a very heavy item in shipments to the United Kingdom), there is scope for a large expansion. The sawmillers are enterprising, and there is sufficient forest to meet a greatly increased demand without departing from the principle of a sustained yield.

New Zealand

• A New Zealand company has ordered £500,000 (about $1,500,000) worth of equipment for its projected kraft pulp mill near Kinleith. The mill, the first of its kind in New Zealand, is expected to start production at the end of 1951. The plant is being supplied by the United Kingdom, Australia, Sweden, and Finland. The mill and auxiliary operations will cost £2,000,000 (approx. $6,000,000). The company will supply at least 12,500 long tons (12,700 metric tons) of pulp yearly to an Australian consumer for twenty years.

Panama

• A new forest-products company, employing modern United States machinery, technical skill, and scientific control, will tap Panama's rich tropical forests to manufacture a variety of wood products. Initial operations will be confined to the manufacture of kiln-dried lumber (chiefly mahogany and *maria*), doors, millwork, flooring, veneers, and plywood. The company's equipment includes a sawmill capable of producing 15,000 board feet (35 m^3 (s)) of lumber daily, a dry kiln with a capacity of 50,000 board feet (118 m^3 (s)), and a veneer and plywood mill with a daily capacity of 100,000 square feet of 1/10-inch veneer (9,300 m^2 of 0.25 cm. veneer) or 25,000 square feet of ¼-inch plywood (2,300 m^2 of 0.64 cm. plywood).

Trinidad

• In order to reduce reliance on imported lumber, efforts are being made to stimulate interest in the increased use of Trinidad's timber resources. These include plans for requesting funds for further development of the industry from international or other investment sources. If sufficient capital became available, the lumber industry could eventually become of real importance in the territory .

Policy, Legislation, and Administration

Canada

• On 18 January 1950 the former Dominion Forest Service was established as the Forestry Branch of the newly created Department of Resources and Development of the Federal Government. Mr. D. A. Macdonald, who occupied the post

of Dominion Forester, has been appointed Director of the Forestry Branch.

• On 30 November 1949 the House of Commons approved the Canadian Forestry Act, which provides the necessary legal authority for activities of the Federal Government relating to forestry.

The forests and all other natural resources lying within the boundaries of the ten provinces of Canada are controlled by the provincial governments; only the resources of the northern territories and certain special areas, such as the national parks, are administered by the federal authorities. The Federal Government has an important interest in forests and forest industries, however, because of the revenue derived from taxation and also the very important part that forest products play in Canada's exports. The new Act authorizes an extension of federal assistance to forestry through the conduct of research in forestry and forest products and by means of agreements with any province for assistance in protection, improved utilization, and management of forest resources. Establishment of national forest or forest experimental areas on public lands held by the Federal Government is authorized, and provision is made for the establishment of suitable regulations for their management.

It is believed that the new Act, while in no way infringing on the established rights of the provinces to manage their own forests, will enable the federal authorities to offer increased co-operation and assistance and that it will mark an important step forward in forest conservation.

• In December 1949 the monthly journal of the Quebec Forestry Association, *Forêt et Conservation*, published the text of a paper read at the recent Congress of the Association of Forest Engineers of the Province of Quebec.

In this paper the author first points out the importance of the forestry industry in Quebec. It has assumed considerable proportions as a result of the development of the paper industry: 90 percent of the territory of the Province is set aside as forest reserves; 33,000 lumberjacks work in the forests; 25,000 workers are employed in wood-using factories at annual wages totaling $125,000,000. Forty-eight factories (including 31 pulp and paper mills, 7 pulp mills, and 10 paper factories) have an annual output valued at $350,000,000. Cities and villages have been born whose existence very often depends entirely upon this industry.

Speaking of the role played by the forest engineer, the author stresses the need to take stock of results thus far achieved and future prospects. He formulates the local forestry problem in the following terms: "Do we, in 1949, have a sufficient number of forests under exploitation to continue to furnish supplies to 48 pulp and paper mills, 4 additional mills in New Brunswick and several others in Ontario and in the United States, or must we soon reduce our cut by from 50 percent to 75 percent, with the resultant closing of a proportional number of factories?"

In attempting to answer this question, he estimates that during the past fifty years over half of the forested land has been devastated by fire, insects, or windfall. As far back as 1929, he recalls, he had warned that the Province was approaching the "moment of the disappearance of pulpwood in accessible and economically exploitable forests, and that during the years 1950 to 1960, we would see the exhaustion of these forests and probably the closing down of many of these pulp and paper mills." In 1937, the Government, conscious of this danger, prohibited the construction of new pulp and paper mills. However, production statistics show that, although not a single additional pulp or paper mill has been constructed since that time, the annual pulpwood cut has jumped from four million cords to seven million as a result of the increased speed of paper-making machinery. Clear-cutting of forests has continued, stockpiles have disappeared, increasing quantities of wood are being exported to other provinces and to the United States, while in 1949 plantations throughout the Province covered the equivalent of only 750 acres; after fifty years, these plantations will produce about six thousand cords of wood, or enough to supply a large mill for twelve days.

The author believes the main reason for this catastrophe, which he considers imminent, is the Law of 2 October 1868, which, because of the development of the pulp industry, saddled the Crown lands with a heavy burden by underwriting a mortgage amounting to the formidable figure of a thousand million dollars. This has made it difficult for the Government to take adequate measures to insure the perpetuity of the forests and guarantee the reimbursement of this capital.

Germany

• In the Soviet Occupation Zone in Germany, ownership of large estates has been abolished. Estates in excess of 100 hectares (including land and forest) have been confiscated. As a result of the agrarian reform, some 827,000 hectares (29 percent of forest land area in the Zone) have been turned into a "land fund"; of this, 581,000 hectares have been turned over to communities and to "new" peasants in parcels of 1-2 hectares per farm. This has radically changed the forest ownership picture in Eastern Germany. The area of state forests has risen from the former 33.6 percent to 50 percent; and if municipal and community forests are considered, the area of publicly owned forests would amount to 70 percent.

All forests, irrespective of ownership, are now under a single central administration. In 1949 a rearrangement of the boundaries of the individual forest units was begun. In the past these boundaries were determined by ownership, and, as a result, the forest areas presented a patchwork of state forests intermingled with private and other forests of diversified ownership. This required separate managements and large administrative staffs, and precluded correlation in forest management. Under the new arrangement all forests within a region are organized into one forest. Small forest land owners, especially the new peasants, band together voluntarily into forest co-operatives for joint forest management. This movement is spreading rapidly as it insures orderly handling of their forest properties and prevents their devastation.

The forestry profession is now being filled from the ranks of experienced forest workers who, after taking one or two years of theoretical training in special forest schools, are placed in positions of high administrative responsibility. During 1946-48 some 600 workers graduated from such schools. Courses in forestry are again being given in the Eberswalde and Tharandt Forest Academies. Plans have been prepared for reforesting, in the course of the next five years, all bare land suitable for forest growth. In 1948, some 23,000 hectares had already been reforested; in 1949, 40,000 hectares were to be planted and in 1950, 60,000 hectares. To compensate for the overcutting of the past, the annual cut has been lowered from year to year. Thus the volume of timber cut in 1949 was only 60 percent of that cut in 1948.

United Kingdom

• According to an article in *The Empire Forestry Review*, the comparatively long-term problems in connection with the new forests planted to afforest a large portion of the area of the United Kingdom were reviewed at the September 1949 meeting of the British Association for the Advancement of Science.

The article states: "There is one issue, however, that has hitherto been badly neglected. It is that of quality versus quantity . . . there is little doubt that a plantation which makes a good, vigorous start, and particularly one which quickly closes canopy, is much the most likely to continue to grow well. But rapid growth means wide growth rings, light wood, and very usually coarse growth, large knots, and timber of uneven and often poor quality, particularly if the rapid growth is used as justification for wide spacing in youth without pruning operations.

"This problem is easy to state, less so to answer. . . . It must, of course, always be kept in mind what we are growing the timber for. In fact, is quality as important as quantity? Are we not growing against a possible emergency need involving mainly short-term uses where serviceability is all that is wanted, indicating as the objective maximum quantity of supplies of a quality just good enough for the purpose in mind? What cannot we manage with if we are pushed? But this argument would ignore the implications of the second part of our primary objective. We have not only to raise, but also to hold, an adequate reserve. Holding a stock of growing timber unavoidably involves the production of a large volume annually from thinnings and ultimately mature timber which will go towards meeting current requirements both for timber as such and as raw material for industry. Here, quality becomes much more important, particularly if the home-grown material has to compete on even or (as now) unfavorable terms with imported material. . . ."

United States of America

• An experienced author, writing in a recent U.S. trade journal, describes the establishment of pulp and paper mills

in the southern states during the past decade. By opening a market for the small-sized trees, and thus making thinning and other improvement works a profitable proposition, it was expected that this development would encourage private forestry on scientific lines. But unfortunately this expectation has not materialized. In the author's opinion the main stumbling block has been the pattern of land ownership.

Private owners of medium and large-sized forest tracts might be expected to have some interest in the improvement of their forests, but they are very few in number. According to an estimate of the U.S. Forest Service, wood lots of 5,000 acres (2,000 ha.) and less form nearly 76 percent of the total forest area under private ownership in the United States. There are about 4,200,000 landowners in this category, controlling 261 million acres (106 million ha.), or an average of 62 acres (25 ha.) each. The following remarks apply mainly to this category of private ownership, which controls the bulk of forest land.

State and federal funds are at present being spent at an increasing rate on extension forestry programs, mainly with a view to educating this large number of private owners in the art of better management of forests, but the result achieved is not at all commensurate with the expenditure involved. For example, in one state, in spite of the high price of all categories of forest products, the landowners cannot be persuaded to attempt even rudimentary forest management as they are preoccupied with other kinds of crops which give them about 95 percent of their annual income.

Two other examples from another state illustrate the effect that the nature of the holding has on proper management of private forests. In one case, where small woodlots are owned by a population largely urban, there has been systematic propaganda from authoritative bodies for better management of forests for the last twenty years or so. The market is good, the extension services provide technical personnel, taxation is low, and the expenses of fire protection are paid from the general funds. In spite of the facilities, little or no progress has been possible, as the wood lots are far too small to permit successful protection and the income from the forests is not large enough to interest the owners in better management. In the other case, the tracts under individual ownership are large, ranging from 5,000 to 50,000 acres (2,000 to 20,000 ha.) in size, and the owners are largely dependent on the income from forests. As soon as market conditions became favorable, these owners became conscious of the benefits from scientific forestry practices and achieved good results, even though they were not so fortunate in respect of outside help, either technical or financial.

The solution proposed is to develop a plan of co-operative management which would encourage small landowners to participate. There is bargaining strength in unity, and economies can be effected through large-scale operations under efficient management. Co-operative management projects would foster permanent industries and eliminate much of the waste, both in the forests and the mill. The author believes that this approach would be likely to succeed because Americans like organization and joint action. In fact, it has already been tried with success in the northeastern and Great Lakes states of the United States.

Meetings

• The International Poplar Commission which met at the Palais des Nations, Geneva, 13-14 October 1949, concluded its session with a field study in the Lower Valais and the Canton de Vaud, at the invitation of the Federal Forestry Department, Berne.

At this session, experts from Belgium, France, Italy, Netherlands, and the United Kingdom, under the Chairmanship of Mr. Philibert Guinier (France), examined the results of the previous session held in Belgium and Holland in April 1949, and drafted reports on the nomenclature and identification of the black poplars grown in Europe, the utilization of poplar wood in industry (mechanical wood pulp, matches, plywoods, etc.), and poplar diseases and insect pests.

• The third Convention of the Pine Lumber Producers Association of Mexico was held in Acapulco, Mexico, 8-10 December 1949. The Convention was inaugurated by the Governor of the State of Guerrero, and attended by seventy-five delegates representing government departments and private enterprises.

Papers were presented and discussions took place on the following subjects: (1) standardization of dimensions of sawn lumber; (2) utilization of timber from logging waste; (3) rational utilization of forests; (4) erosion and soil conservation; (5) chemical utilization of wood waste; (6) utilization of waste for the manufacture of wood flour; (7) methods for determination of moisture content in wood; (8) forest protection and forest credit; (9) cutting practices and silvicultural methods in Mexican forests; (10) railroad tie supplies for the national railroads; (11) the drying of lumber; (12) reforestation in the State of Durango.

Resolutions were adopted for the establishment of a Research Laboratory for Forest Products and for awarding scholarships to forestry students.

The next Convention will be held at Chihuahua in October 1950.

• The annual meeting of the Canadian Society of Forest Engineers was held in Toronto 24-26 October 1949. The meeting was organized into six groups: 1) forest management; 2) forest entomology; 3) wood utilization; 4) forest fires; 5) surveys; and 6) wildlife.

• During the Third World Forestry Congress the Standing Committee of the International Union of Forest Research Organizations held several meetings, presided over by Professor Burger, President of the Union, and attended by Messrs. Pavari (Italy), Oudin (France), Guillebaud (United Kingdom), Van Vloten (Netherlands), Lönnroth (Finland), Fromer (Poland), Etter and Fontaine (Secretariat). FAO was represented by M. Leloup, Director of the Forestry and Forest Products Division, and D. R. Cameron, Chief of FAO's European Forestry Working Group.

The Committee examined its financial status, the steps to be taken to increase membership, the practical working of the scheme whereby the Secretariat is provided by the FAO Geneva Office, and the setting up of research sections. In connection with the last point, the tasks of the research sections were defined and Chairmen nominated. Upon the invitation of Professor Pavari, the Standing Committee decided to hold its next meeting at Florence in September 1950. Chairmen of the research sections will be invited to attend this meeting.

A joint FAO/IUFRO Bibliography Committee also convened and held three meetings. This Committee is composed of Messrs. Harrison (FAO), Ford Robertson (United Kingdom), Saari (Finland), Oudin (France), and Fontaine (FAO). Following the election of Mr. Harrison as Chairman, the Committee proceeded to a general examination of the new "Oxford" bibliography classification drawn up by the Commonwealth Forestry Bureau in England. The Committee also discussed the publication of a bibliography by the Union, the situation with respect to abstracts, and the value of giving summaries of scientific articles in several languages.

Since the Helsinki meetings, the work of the International Union has been concerned mainly with the membership campaign, the effective constitution of research sections, and the determination of the problems to be dealt with by these sections.

• The following meetings in which FAO is concerned are scheduled for 1950:

ECE Timber Committee, Geneva, 3 April.

Forest and Soil Conservation meeting, Nicosia, Cyprus, 15-25 April.

International Poplar Commission, Geneva, 18-21 April.

Technical meeting on timber grading, Dalat, Viet Nam, 3-8 April.

Mediterranean Subcommission, 2nd meeting, Algiers, 8-13 May.

FAO/IUFRO Bibliography meeting, The Hague, June.

Land Utilization in Tropical Regions, Nuwara Eliya, Ceylon, 7-19 August.

European Forestry and Forest Products Commission, 3rd session, Geneva, August.

Asia and Far East Forestry and Forest Products Commission, 1st session, Bangkok, October.

Latin-American Forestry and Forest Products Commission, 3rd session, Santiago, Chile, December.

Corrigenda

Vol. III, No. 6, p. 211, second paragraph:

The production of sawn timber in Australia in 1948 should read: 548,000 standards.

Vol. IV, No. 1, p. 47:

The trade journal *Wood* (United Kingdom), mentioned in the review of *Wood Specimens*, is a monthly publication and not a weekly as stated.

Reviews

Green Glory—The Forests of the World. Richard St. Barbe Baker. Pp. 253, illus. A. A. Sym, Inc., New York. 1949. $3.50.

Richard St. Barbe Baker is well known as a protagonist of forest conservation, and *Green Glory* is one of the many books he has written on the subject. He started his career as a forest officer in equatorial Africa and later served in various capacities in different parts of the world. He has traveled extensively, and much of what he has written in this book is based on his personal observations.

In *Green Glory* Mr. Baker describes the forest resources and forestry practices of the world by regions, emphasizing the role of forests in the national economy in each country. Referring to the scientific management of the forests of Central Europe, he writes: "We can witness successive generations of Europeans who have by trial and error, by research and experiment, and by hard necessity managed the adjustment of dense human occupation of the land without the destruction of the land's productive capacity. Down throughout the ages the forest has been an essential feature in the problem of land utilization and has profoundly influenced not only a country's own well-being but that of people of other countries of the world." The opposite extreme, resulting from misuse, can be seen in Africa: "Away to the north of the Gold Coast in the French sphere of influence, the nomadic farmers for years have been literally driven from the oncoming deserts. The moving sands have buried the sparse crops and are racing them into the narrow wedge of forests that remain. Here may be witnessed racial suicide on a bigger scale than the world has ever seen. Knowing the end of the forests to be near and with little chance of growing food, the chiefs have forbidden marriage and the women refuse to bear children, for they will not raise sons and daughters for starvation."

While describing in very broad terms the forests and forestry practices in different regions—from Soviet Russia and Central Europe to Africa, from India and China to the islands of the Pacific, New Zealand, Australia, and Japan, from South America to Canada—the author sums up the changes, both economic and physical, that have taken place in different countries as a result of the indiscriminate destruction of forests. The exact nature of the damage differs from place to place, according to variations in the local climatic conditions; it takes the form of desert in Africa, torrents and floods in Italy, and so on.

The author continues: "The health and the economic security of the human race depend on how well the forests of the world are managed. All the countries in the world are suffering the penalty resulting from man's neglect to plant where he has reaped. . . . How the forests are managed decides whether the rain and snow they receive will be a blessing or a catastrophe. . . . When the supply of water fails and farms are abandoned, communities are impoverished and cities and cultures die, leaving the crumbling ruins to mark their transient glory. . . . Water is the source of life to a man dying of thirst or a farm needing irrigation, but it can also be a deadly enemy to all life when uncontrolled by the essential forest covering." These are the conclusions drawn from a survey of conditions prevailing over all parts of the globe.

"The great task of conserving and replenishing the forests of the world and reclaiming the deserts and waste spaces requires the concerted action of every country and at the same time provides a meeting ground for all men." The author concludes by suggesting world-wide reforestation as the only remedy for past mistakes. Of course, this does not imply the fantasy of clothing the surface of the earth with an unbroken forest cover. All that is intended is to urge a system in which "every city has its catchment area and every farm and hamlet its protecting trees." Valley settlement is really the cradle of sound culture. A co-ordinated scheme of reforestation would, in the opinion of the author, "check, stop and reverse the advance of the deserts upon good land of the globe and thus relieve growing shortage of food." If "genuine co-operation could be rallied internationally for the purpose of increasing the primary producing areas of the land surface, the tendency will be towards peace and prosperity." With the object of furthering international co-operation, the Society of the Men of Trees, of which the author was the founder, passed the following resolution:

"That, realizing in face of the present world famine the dependence of man on trees and forests and seeing the forests disappearing and the deserts encroaching on the remaining food sources at a rate up to 30 miles per year on 1000-mile fronts in three continents, this gathering of national representatives of 24 countries requests the aid of the United Nations Organization in preparation of a World Charter for Forestry."

Green Glory focuses the attention of the public on this resolution. Giving a world prospect on forest resources and their influence on the life of mankind, it is indeed a "cosmorama," as the author calls it. The book treats the subject non-technically and is very well illustrated. It should prove a useful link in the chain of books now being published for the purpose of educating the public on forest conservation and convincing the politicians of the long-range benefits of forest conservation and the need for reforestation.

Applied Silviculture in the United States. R. H. Westveld. 2nd Edition. Pp. 590, illus. John Wiley & Sons, Inc., New York; Chapman & Hall, Ltd., London, 1949. $6.00.

This second edition takes account of developments which have occurred in the ten years since the first edition was published. Research during this period has strengthened the scientific basis for applying silviculture. Improved economic conditions have broadened the market for wood, especially that for low-value species and low-quality material, and thus have bettered the opportunity for closer utilization and better silviculture. Publication of *Forest Cover Types of Western North America* by the Society of American Foresters has put the type classification on a more orderly basis than heretofore.

As in the first edition, a broad interpretation of the scope of silviculture is adopted by including slash disposal, disease and insect control, regulation of grazing, control of burning, and control of logging damage.

Seventeen forest regions in the continental United States are recognized and one in Alaska. These regions are: (1) Northeast spruce-hardwood region; (2) New England white pine region; (3) oak region; (4) Allegheny hardwood-pine-hemlock region; (5) Southern Appalachian region; (6) Southern pine region; (7) Southern bottomland hardwood region; (8) Central hardwood region; (9) Lake States region; (10) Douglas-fir region; (11) Northern Rocky Mountain region; (12) Lodgepole pine region; (13) Southwest ponderosa pine region; (14) California pine region; (15) Northwest ponderosa pine region; (16) Black Hills ponderosa pine region; (17) Redwood region; and (18) Southeastern Alaska.

A chapter on each region summarizes information under general headings. "Description and History" includes location and ownership, physiographic features, climatic features, development of lumbering, and the effect of past practices. "The Forests and Their Management" covers the main types and groups of types under three subheadings: (1) ecological basis, having particular reference to composition and character of forest, stand regeneration and development, and windfall; (2) economic basis, including utilization and marketing problems, growth and rotation, and financial aspects; and (3) application of methods, under which cutting and planting, slash disposal, disease and insect problems, and control of damage are treated. The number of types discussed varies from one to eight in the various forest regions, and, in most cases, types have been grouped; i.e., where a key species of high value is a component of several types recognized as distinct by the Society of American Foresters. Each chapter includes a list of references now brought up to date which provides further material for students interested in more extensive study of forest regions or forest types. The book includes both author and subject indexes.

Because of the effect of inflation on dollar value, the author has, so far as practicable, stated costs in terms of man hours or by ratios to show relative values.

The material on the forest regions and types of the western United States naturally deals primarily with the problems of converting virgin forests to managed forests, whereas generally in the eastern United States the problems are those of managing second-growth forests or residual stands. In such western regions as the Douglas-fir and the California pine, however, a considerable amount of cutting in second-growth stands is under way. The technical literature, and hence this book, does not seem to have fully caught up with current practices. Moreover, the expanded opportunity for silvi-

culture created by marketability of formerly unmerchantable species such as some of the true firs in the western United States has not yet been fully reflected in technical literature. Any such textbook, however, can never be fully up-to-date, particularly in periods when economic conditions are changing rapidly, and it is to be expected that subsequent editions of the book will contain such material.

The book brings forth much of the significant research and experience, and will serve as a valuable summary of the state of knowledge and the state of practices in the forest regions and forest types. It is intended as a teaching text for technical students, for which purpose it is excellent; moreover, it will serve those who wish a readily available conspectus of the state of silvicultural knowledge and practices in the forests of the United States.

The Earth's Green Carpet. Louise E. Howard. Pp. 258. Rodale Press, Emmaus, Pennsylvania. 1947. $3.00.

The name of Sir Albert Howard is well-known as a leader in what has come to be known as the "school of organic farming." In this book his wife and coworker sets down in nontechnical language the doctrine, the evidence, and the proposals which Sir Albert and many others have developed.

The central thesis is the restoration and maintenance of a fertile soil. In nature, each of the manifold kinds and types of vegetation develops and maintains a closed economy in which minerals withdrawn from the soil in the processes of growth are eventually returned to the soil as leaf fall or through death of the plants and are made available for re-use through the workings of the micro-life in the soil itself.

This natural wheel of life is inexorable. Man does and must use land and thereby destroy or greatly modify natural processes which maintain fertility, soil structure, and susceptibility of the soil to damage or removal by erosion. The decrease in soil fertility often induces great increase in diseases and insects of cultivated plants and animals and also of man when his food products are derived from infertile soils. The spectacular and costly efforts to restore soil fertility by application of fertilizers and to control diseases and insects by directly attacking them tend to be ineffective so long as basic natural fertility, structure, and life of the soil remain imperfect.

The widespread practice of shifting cultivation might be effective in restoring fertility if sufficient time were allowed after the land is returned to forest, but usually that is not the case.

The forest is the perfect example of the complex organism of trees, shrubs, and lesser vegetation, animals, birds, and insects which, if treated properly, develops and maintains soil fertility and stability. In nature, forest tends to expand at the expense of grass, the other great natural type. But, historically, grass is winning. The author's chapter on "The Retreat of the Forest"—over ten percent of the entire book—traces the consequences of removing forests on soil structure and fertility, the mechanisms of forest influences, the roles and values of hedgerows and shelter-belts in agriculture, and measures short of perfection which can minimize the ill effects of large scale removal of forests. But the author concludes that probably in the long run only the restoration of forest—the unique piece of natural machinery—can completely restore fertility. This would involve treating the forest as a long-term rotation crop, would represent short-term sacrifices, but would be the wisest of all plans. The alternative is to continue present and past errors in using the soil and to accept the plagues and dwindling of soil fertility which follow the retreat of the forest.

Foresters will find in this book a powerful, comprehensive, and cogently-reasoned statement of the role of forests in the use of the soil. It is well to have the broad picture, whatever the pressures and urgencies of the current and immediate problems of everyday work. Forestry in the broadest sense may in time come to be more widely understood as an indispensable foundation of agriculture, not a convenient appendage.

Vegetable Gums and Resins. F. N. Howes, D.Sc., Principal Scientific Officer, Royal Botanic Gardens, Kew. Pp. 188. The Chronica Botanica Co., Waltham, Mass.; Stechert-Hafner, Inc., New York City. 1949. $5.

Economically, vegetable gums and resins are very important plant products. Their consumption by manufacturing industries is quite large, and the volume of world trade in them is estimated at over three-quarters of a million tons per annum. As many thousands of species in the vegetable kingdom are capable of yielding gums and resins of some utility, it was clearly impossible for the author to deal with all of them. He has, therefore, confined his discussion to those of commercial importance, bringing up-to-date and summarizing the many important contributions to their study that can be found scattered over a wide range of publications from different parts of the world. An important feature of the book is that the various gums and resins entering the trade are connected with their botanical origin, and the species concerned are illustrated by botanical drawings, This should enable organized collection and thereby minimize chances for adulteration.

The gums and resins are distinguished according to their chemical definition, and each group is dealt with in a separate chapter. Valuable information is given on the important gums and resins marketed under various trade names all over the world, including information on their availability, their sources, their chemical and physical properties, methods of collection, and details on grading, price, etc. Gum arabic and rosin production in different countries has been discussed in great detail, which is justified because of the important uses of these products. Lac and shellac, though not essentially of vegetable origin, have been included to make the book sufficiently comprehensive.

Forest Pathology. John Shaw Boyce. 2nd edition. Pp. xi + 550. McGraw-Hill Book Company, Inc., New York and London. 1948. $6.

The second edition of this standard American text and reference book includes a large amount of new information which has appeared since the first edition of 1938. It is thus the most comprehensive and up-to-date work on forest pathology available to American foresters.

Essentially the book is organized on the basis of the type and location of the disease, rather than on the detailed taxonomic characteristics of the causal agencies. In this way it is expected to be more useful to practitioners who must deal with the multitude of diseases occurring on the American timber species. Introductory material includes a general discussion of the nature of disease of forest trees and a brief description of the principal groups of fungi which cause consequential diseases. The various chapters then deal with the noninfectious diseases, seedling diseases, root diseases, foliage diseases of hardwoods, foliage diseases of conifers, and the following stem diseases: rusts of conifers; cankers of conifers; cankers of hardwoods; galls, witches brews, and faciations; diebacks and wilts; stem diseases caused by mistletoes, dwarf mistletoes, lichens, and climbers; decay.

In each of these chapters the disease is discussed under the following headings: 1) history and description; 2) hosts; 3) damage; 4) symptoms; 5) causal agency; and 6) control. Each chapter also contains an extensive and up-to-date bibliography of the pertinent American technical literature.

A group of chapters deals with the deterioration of dead timber and of forest products, with separate consideration of decay and sap stains. A chapter on the principles and methods of forest disease control treats separately of problems of native diseases and of the often catastrophic imported diseases such as white pine blister rust (*Cronartium ribicola*) and chestnut blight (*Endothia*). The author examines the very great difficulties of effective quarantine against additional imports, but suggests feasible steps, going far beyond present American practice, that might be taken.

An appendix deals with the subject of fungicides.

The book is well indexed and the references, chapter by chapter, are clearly and carefully worked out to include material of current value.

Since the losses of forests, forest trees, and forest products are very great, and since more methods of control are constantly being worked out by the technicians, this book should be extremely valuable to all practitioners, who must of necessity deal with problems of disease control. It will be valuable as well in teaching the oncoming classes of foresters, who will likewise deal with such problems as forests and timber continue to increase in value.

New Knowledge in Forestry. Report of the Chief of the Forest Service, 1949, United States Department of Agriculture. U. S. Government Printing Office, Washington, D. C. 15 cents.

Mr. Watts, the Chief of the U. S. Forest Service, continues to stress a major aspect of forestry in each year's report. In 1948 it was national forest administration; in 1949, new knowledge in forestry. "Wise management and use of our forest resources depends upon sound knowledge," he observes. "Through well-organized research we can learn how to increase forest productivity and achieve more effective conservation. Research can show us better ways of doing things, at lower costs."

Research has always been a major activity of the Forest Service; indeed it antedates by many years the administrative activities. The present pattern of regional forest experiment stations was first set in 1905 in the Southwest, and the Forest Products Laboratory was started in 1910. The expansion of both and the refinement of the regional stations in work centers have been reported in detail in UNASYLVA, and are recounted briefly in the 1949 Annual Report, which emphasizes the serious inadequacy of research work in Alaska and the lack of a regional station in the Great Plains.

In reporting on accomplishments in research under the broad headings: forest-management research; research in forest-fire control; range research; forest influences; forest-economics research; forest-products research; and tropical-forest research, it is inevitable that the barest sketch can be given of many projects of very great value and significance. But, as the research is clearly referenced to the practical problems, the reader is able to grasp the ways in which it is being aimed and directed at specific targets.

During the past half-century, research has changed from the simple and empirical methods of the earlier years to the fundamental methods of today. Mr. Watts emphasizes that this trend must continue. He sees the necessity for research to keep ahead of the needs of management, with daring and imagination as its essential ingredients; and as wildlands generally are increasing in value, more precise research answers and more refinement in applying research results to each of the many variations in site and cover conditions are necessary.

As to organization of research, Mr. Watts says: "Through years of experience, the Forest Service has developed what it believes to be a desirable balance between co-ordination and independence in its research program. Its research staff maintains close contact with industry, with public and private land managers, with other public agencies, and with other research institutions. Its regional experiment station set-up keeps it in touch with local problems; and the headquarters research divisions endeavor to provide the necessary integration and co-ordination. At the same time its workers are encouraged to do their own thinking and to exercise initiative. They are under no obligation to any special groups or interests. The ultimate criterion in determining the direction of the research program is the public interest."

Finally, Mr. Watts claims, the results of research are not being applied as widely as they should. Far too many private timber operations, particularly on small woodlands owned by individuals, do not utilize the information available, and the forests suffer.

The report deals briefly with the other major arms of Forest Service work: co-operation in state and private forestry and administration of the national forests. Largest in size of the co-operative programs is that dealing with fire control on state or private forest lands. This now covers 339.5 million acres (137,400,000 hectares), 11.5 million more than in the preceding year. But 99.5 million acres (40,300,000 hectares) remain without organized protection. On the protected lands the burned area was 6/10 of 1 percent in 1948; on the unprotected lands, an estimated 14-1/3 percent. The job of fully protecting the forest lands will cost 40 million dollars, and Congress has recently authorized the 20 million dollars representing the Federal Government's share.

A re-analysis of the dollar economies of the national forest enterprise as a whole shows the following annual costs and returns:

Nonmonetary returns, evaluated:	
Recreation and wildlife	$ 25,000,000
Water	300,000,000
Free permits for timber, range, etc.	1,000,000
Cash receipts to the Treasury	32,000,000
Other monetary returns	4,000,000
Increase in net growth and inventory revaluation	50,000,000
Total annual returns	$412,000,000
Total annual operating costs	$ 58,000,000

These costs include, in addition to all appropriations for operating expenses, a depreciation charge on roads and other improvements, interest on investments, and payments to the states of 25 percent of all receipts.

The cut of national forest timber remained at 3,700 million board feet; the return increased from 20.6 million dollars to 26.9 million dollars. Mr. Watts says that maintenance of the present level will require opening up many new timber areas and that a 50 percent increase in cut is possible if access is worked out. A program of 100 million dollars a year for five years is needed. On the 180,374,000 net acres of national forests the Forest Service maintains 75,000 miles of road and 88,000 miles of trail, and the cost leaves little from current appropriations for new construction. The current receipts (nearly 32 million dollars, of which nearly 27 million dollars was from sale of timber) should justify the capital investments required to make the national forests fully accessible and productive.

This report, like earlier reports, is an essential document for those who wish to keep up to date on the problems and accomplishments, the successes and failures, of American forestry. The all-too-brief summary of research is valuable to those faced with the problem of establishing research organizations and programs essential to the conversion of unmanaged forests to a fully managed and productive condition.

Forest Management Education in Oregon. Walter Fraser McCulloch. College Press, Oregon State College, Corvallis, Oregon. 1949.

The first major opportunity for employment of foresters in the United States of America came with the establishment of the western National Forests. These were generally inaccessible and little used, and the early work was largely custodial in character. The first forest schools based their curricula on the technical skills which were needed at the time. Since nearly all employment was in the public forests, much emphasis was placed on preparing students to pass the qualifying examinations of the employer.

Today the public forests are increasingly under active use and management, not alone for timber, but for the other values of watershed, range, wildlife, and recreation. Forestry involves both correct technical handling of each use and the more difficult task of harmonizing the often competitive demands of several uses on the same area at the same time. Moreover, as volume of work has increased, the public forester has had more and more to work through employees. He is thus a manager and administrator rather than a lone technician.

Employment of foresters by industry has increased greatly and it is clear that desirable qualifications for such employment differ in certain respects from those of publicly employed foresters.

Within the forest schools the great increases in enrollment have made it more and more difficult for instructor and student to have more than a remote impersonal relation, and planned, continuing counseling of students has weakened. Emphasis on instruction in techniques has left little curricular time for even a minimum of general education to develop the student's intelligent interest in and knowledge of the world in which he will work and to prepare him to discharge his duties as a citizen and member of society. At the same time, the over-all limitation of a four-year course makes it difficult to broaden the educational base, however desirable.

Surveys and analyses show clearly that major changes in curricula are urgently desired by employers and graduates alike and that defects which have resulted from merely slight changes in the old purely technical education are recognized clearly.

What, then, can a forestry school do to meet the very real needs of forestry and employers today more adequately; to prepare its students so that their potentialities as professional men and as citizens will be more fully developed; to teach management as well as techniques; to prepare men for private as well as public employment?

In this scholarly and objective monograph, *Forestry Management Education in Oregon*, the author undertakes to answer these pressing questions for one old-line school. The often conflicting pressures of general educational theory and doctrine of employers' wishes, of local needs, of time limitations, make any solution necessarily a compromise, as the author recognizes.

But he concludes (and the plan is in effect at his school) that careful and systematic counseling of students by the teaching staff will eliminate men who have chosen the wrong career and strengthen those who have qualities for success as foresters. The use of standard interest and aptitude tests is considered desirable; moreover, supervision and guidance of outside work during the four-year course can be given, and guidance of graduates to jobs for which they are best adapted can strengthen their chances for success. Some instruction in personnel management can be given, and greater leeway for general education left in the curriculum. Differential instruction in public and private forestry can be provided.

There will be disagreement with the detailed curriculum set up, with the procedures and forms used in counseling and in giving personal guidance; in short, with the details of the Oregon State plan. But the treatise is worthy of widespread attention. It may profitably be studied by many another forest school and by persons who face the task of setting up new schools.

Forestry and Forest Products BIBLIOGRAPHY

Beginning April 1950, FAO is publishing a monthly Forestry and Forest Products Bibliography. The Bibliography will be sent separately to readers of UNASYLVA free of charge.

Comments and suggestions are welcomed.

Any subscriber not receiving his copies regularly should advise FAO Bibliography, Division of Forestry and Forest Products, 1201 Connecticut Avenue, N. W., Washington 6, D. C., U.S.A.

SALES AGENTS FOR FAO PUBLICATIONS: ARGENTINA: Editorial Sudamericana, S.A., Alsina 500, Buenos Aires; AUSTRALIA: H. A. Goddard Pty., Ltd., 255a George Street, Sydney; BRAZIL: Livraria Agir, rua Mexico, 98-B, Rio de Janeiro; CANADA: The Ryerson Press, 299 Queen Street West, Toronto 2, Ontario; CHILE: Edmundo Pizarro Rojas, Merced 846, Santiago; CHINA: The Commercial Press Ltd., 211 Honan Road, Shanghai; COLOMBIA: "Agricultura Tropical," Avenida Jiménez No. 8-74, Oficinas 416-416a, Bogotá; COSTA RICA: Trejos Hermanos, Apartado 1313, San José; CUBA: René de Smedt, La Casa Belga, O'Reilly 455, Havana; CZECHOSLOVAKIA: Orbis, Narodni 37, Prague I; DENMARK: Einar Munksgaard, Norregade 6, Copenhagen; EGYPT: Librairie de la Renaissance d'Egypte, 9 Sh. Adly Pacha, Cairo; EL SALVADOR: Librería Navas, la Avenida Sur 37, San Salvador; FINLAND: Akateeminen Kirjakauppa, 2 Keskuskatu, Helsinki; FRANCE: Les Editions A. Pedone, 13 rue Soufflot, Paris 5; GUATEMALA: Goubaud & Cía Ltda., 5a Av. Sur No. 6a y 9a, Guatemala; HAITI: Max Bouchereau, Librairie "A la Caravelle," Boîte Postale 111-B, Port-au-Prince; HUNGARY: Grill's Bookshop, R. Gergely, Ltd., Dorottya Utca 2, Budapest V; INDIA: The Oxford Book and Stationery Co., Scindia House, New Delhi; The Mall, Simla; 17 Park Street, Calcutta; Messrs. Higginbothams, Mound Road, P. O. Box 311, Madras; Kitab Mahal, Sohrab House, 235 Hornby Road, Bombay; IRELAND: The Controller, Stationery Office, Dublin; ISRAEL: Leo Blumstein, Book and Art Shop, P. O. Box 4154, Tel Aviv; ITALY: Requests for FAO publications should be addressed to: The European Regional Office of FAO, Villa Borghese, Rome; LEBANON: Librairie Universelle, Avenue des Français, Beirut; MEXICO: Manuel Gómez Pezuela e Hijo, Donceles 12, Mexico, D.F.; NETHERLANDS: N. V. Martinus Nijhoff, Lange Voorhout 9, The Hague; NEW ZEALAND: United Nations Association of New Zealand, 13 Grey Street, Wellington, C.1; NORWAY: Johan Grundt Tanum Forlag, Kr. Augustsgt. 7A, Oslo; PAKISTAN: *East:* Farcos' Publications, 2 Inglis Road, P. O. Box 13, Ramna, Dacca; *West:* Ferozsons, 60 The Mall, Lahore, Variawa Building, McLeod Road, Karachi; 35 The Mall, Peshawar; PERU: Librería Internacional del Perú, S.A., Casilla 1417, Lima; PHILIPPINES: D. P. Perez Company, P. O. Box 936, Manila; PORTUGAL: Livraria Bertrand, S.A.R.L., 73, Rua Garrett, 75, Lisbon; SWITZERLAND: Librairie Payot, S.A., Lausanne; Hans Raunhardt, Kirchgasse 17, Zurich 1; SYRIA: Librairie Universelle, Avenue Fouad 1er, P. O. Box 336, Damascus; THAILAND: Requests for FAO publications should be addressed to FAO Regional Office for Asia and the Far East, Maliwan Mansion, Bangkok; UNION OF SOUTH AFRICA: Central News Agency, Ltd., P.O. Box 1033, Johannesburg; UNITED KINGDOM: H.M. Stationery Office, P.O. Box 569, London, S.E.1; UNITED STATES OF AMERICA: International Documents Service, Columbia University Press, 2960 Broadway, New York 27, N.Y.; *Locally in Washington, D. C.:* FAO Documents Sales Service, Food and Agriculture Organization, 1201 Connecticut Avenue, N.W., Washington 6, D.C.; URUGUAY: Hector D'Elia, Librería Internacional, S.R.L., Uruguay 1331, Montevideo; YUGOSLOVIA: Drazvno Preduzece, Jugoslovenska Knjiga, Belgrade. Requests from countries where sales agents have not yet been appointed may be sent to FAO Documents Sales Service, Food and Agriculture Organization, 1201 Connecticut Avenue, N.W., Washington 6, D.C., U.S.A.

A current and comprehensive review of United Nations activities—

UNITED NATIONS BULLETIN

In the *Bulletin* the United Nations reports to the peoples of the world on the work of the United Nations and the Specialized Agencies.

The *Bulletin* provides complete, unbiased, and up-to-date reports on the work of the various United Nations organs—the General Assembly, the Security Council, the Economic and Social Council, the Trusteeship Council, the International Court of Justice, and the Secretariat. In addition, the *Bulletin* regularly publishes articles on the battles against hunger, disease, and illiteracy being carried on by the Specialized Agencies.

Edited by UN experts in the field of world affairs, the *United Nations Bulletin* regularly carries special articles and commentaries by world leaders. Other features of the *Bulletin* include:

- Accurate texts of important conventions, resolutions, and other documents.
- A monthly calendar of forthcoming international meetings.
- Biographical sketches of UN personalities in the news.
- Official United Nations photographs of world-wide interest; accurate maps, charts, and tables.
- Reports of international conferences.
- A full index for each volume.

The *United Nations Bulletin* is published twice each month by the Department of Public Information, United Nations, Lake Success, in separate English, French, and Spanish editions. A Russian edition is planned for publication in 1950.

Annual Subscription: $4.50, 22/6 stg., 18.00 Swiss francs
Available in national currencies from all authorized Sales Agents for United Nations Publications.